Cornell University Library

The original of this book is in
the Cornell University Library.

There are no known copyright restrictions in
the United States on the use of the text.

http://www.archive.org/details/cu31924073902284

ORNELL UNIVERSITY LIBRARY
3 1924 073 902 284

Production Note

Cornell University Library produced this volume to replace the irreparably deteriorated original. It was scanned using Xerox software and equipment at 600 dots per inch resolution and compressed prior to storage using CCITT Group 4 compression. The digital data were used to create Cornell's replacement volume on paper that meets the ANSI Standard Z39.48-1992. The production of this volume was supported by the National Endowment for the Humanities. Digital file copyright by Cornell University Library 1995.

Scanned as part of the A. R. Mann Library project to preserve and enhance access to the Core Historical Literature of the Agricultural Sciences. Titles included in this collection are listed in the volumes published by the Cornell University Press in the series THE LITERATURE OF THE AGRICULTURAL SCIENCES, 1991-1996, Wallace C. Olsen, series editor.

New York
State College of Agriculture
At Cornell University
Ithaca, N. Y.

Library

SHEEP, FARM & STATION MANAGEMENT.

COMPILED
BY
E. H. PEARSE.

◆

Published by
THE PASTORAL REVIEW PTY. LTD.
SYDNEY. MELBOURNE. LONDON.

INTRODUCTION.

A WORK has long been required throughout the world for all engaged in sheep raising and farm and station management. I feel that this book will fill that want. the compiler being peculiarly fitted for the task through his long association with " The Pastoral Review."' the brains of the pastoral world during the last thirty years having found their expression through the columns of that paper.

Both the farmer and the grazier are catered for. Little or nothing has been overlooked, and the beginner, together with the man who has already gained a knowledge of sheep and station management by experience, should derive benefit from reference to the following pages.

J. M. NIALL.

Buckiinguy Station, N.S.W.
September 14. 1920.

PREFACE.

FOR many years there has been a demand in sheep-raising countries for a book that will serve as a " guide, philosopher and friend" to the man engaged in producing two of the world's staple commodities, wool and meat, and with a view to satisfying the demand I have attempted, in the narrow confines of this volume, to furnish advice on the many questions with which the sheep man is faced in the course of his work.

It should be understood that what is written is primarily for the assistance of the beginner, although it is hoped that even the man with years of practical experience will find in the following pages some hints or helpful suggestions that were previously outside his knowledge. I have been particularly fortunate in compiling this work in having at my disposal the columns of " The Pastoral Review," a publication which, as its name implies, is devoted to the furtherance of the grazing and farming industries, and whose pages are replete with articles on every conceivable phase of sheep husbandry, written not by professional journalists, but by men who have been through the mill, and whose contributions are based on knowledge acquired during long and practical experience. It is this knowledge that I have endeavoured to put together in condensed and consecutive form, covering the whole field from the taking up of an unimproved block of country and dealing with every phase of station and farm management, including construction of improvements, choice of breed of sheep—with description of each—a brief discussion on wool, every regular operation on a sheep property, such as mating, lambing, marking, classing, shearing, dipping, etc., the diseases of sheep and their treatment, and so on.

Of course, I realise that in some instances readers may not endorse all of the views or advice expressed herein, but in an industry which is so dependent on circumstances and subject to such immense variety of conditions, there cannot be unanimity of opinion. It is hoped, however, that the book will serve the purpose for which it is intended, viz., a practical and handy volume of reference on all questions relating to the care and management of sheep on farm or station.

E. H. PEARSE.

MELBOURNE,
September 21, 1920.

CONTENTS.

CHAPTER I.

INTRODUCTORY.

General Introductory Notes—Gaining Experience—Advice to the "Jackeroo." Pages 1 to 5

CHAPTER II.

PERMANENT IMPROVEMENTS.

WATER SUPPLY AND TIMBER DESTRUCTION.

Water Supply—Excavated Tanks—Elevated Supply Tanks and Troughing—Ring or Mallee Nest Tanks—Clay Tanks—Brick and Cement Tanks—Repairing Iron Tanks—Reinforced Concrete Tanks—Wells and Sub-artesian Bores—Overshot Dams—Timber Dams—Artesian Bores—Drains—Hydraulic Ram—Ring-barking and Timber Destruction—Use of Explosives—Use of Chemicals—Plantations Pages 6 to 32

CHAPTER III.

PERMANENT IMPROVEMENTS (*continued*).

FENCING.

General Notes on Fencing—Six-wire Fences—Five-wire Fence—Four-wire or "Lightning" Fence—General Notes on Vermin-proof Fences—Three-wire and Netting Rabbit-proof Fences—Dog-proof Fences—Fences for Sheep Yards—Wire Splicing—Wire Strainer—Anti-corrosive Preparation for Netting - Pages 33 to 52

CHAPTER IV.

PERMANENT IMPROVEMENTS (*continued*).

GATES AND YARDS.

Five-bar Single Gate—Seven-bar Double Gate—Four-bar Double Gate—Rabbit-proof Double Gate—Sheep Yard Gates—Movable Panel in Wire Fence—Sheep-Counting Gate—Gate Fastenings—Galvanised Iron Swing Flood Gates—Collapsible Netting Fence—Another Falling Flood Gate—General Notes on Drafting Yards—Drafting Races—V-pattern Sheep Yards—Yards for 10,000 Head—Yards for 5000 Head—Circular Yards—Yards for 3000 Head—Lamb-marking Yards—Double Drafting Races—Hessian for Yarding Sheep - - Pages 53 to 83

CHAPTER V.

PERMANENT IMPROVEMENTS *(continued)*.

SHEARING SHEDS AND DIPPING BATHS.

General Notes on Shearing Sheds—Some Useful Designs—Double Decker Woolshed—Shed for Six Stands—Modern Shed in the United States—Drying Shed—Shearers' and Shed Hands' Accommodation—Patent Bale Lifter—A Concrete Sheep Dip—Straight Swim Walk-in Entrance Bath—Straight Swim Plunge Entrance Bath—Circular Swim Bath—Plan of Bath and Yards—To Ascertain Capacity of Bath Pages 84 to 109

CHAPTER VI.

STOCKING.

Choice of Breed—Stocking up—Class of Ewes to Buy—Purchasing Rams—Carrying Capacity Pages 110 to 116

CHAPTER VII.

THE BREEDS OF SHEEP.

The Merino Pages 117 to 131

CHAPTER VIII.

THE BREEDS OF SHEEP *(continued)*.

BRITISH BREEDS.

Romney Marsh—Lincoln—English Leicester—Border Leicester Pages 132 to 140

CHAPTER IX.

THE BREEDS OF SHEEP *(continued)*.

BRITISH BREEDS AND CORRIEDALES.

Suffolk—Southdown—Shropshire—Hampshire Down—Dorset Horn—Ryeland—Oxford Down—Cheviot—Corriedale—Angora Goats Pages 141 to 156

CHAPTER X.

WOOL.

Qualities or Grades of Wool—Tops—Yolk—" Tender" Wool—Staple—Lustre—Character—Crimp—Density—Grades in a Merino Fleece—Noils—Influence of Frame and Climate on Wool—Examining a Fleece on the Sheep's Back—Kempy Wool—Hogget's Wool—Ram's Wool—Colour in Wool—Crossbred Wools—Corriedale Wool—Longwools—Lamb's Wool—Burry Wools and Carbonising Pages 157 to 167

CHAPTER XI.

Cross-breeding and Mixed Farming.

Cross-breeding—Definitions of Stages of Cross-breeding—What is the Best Cross ?—The Border Leicester—The Lincoln—The English Leicester—The Romney Marsh—The Suffolk—Down Crosses for Fat Lambs—Choose the Right Type of Stock—Use Good Rams—Feeding—Rape, Clovers, etc. —Breeding—Putting in the Rams—Treatment of Ewes in Lamb—Cross-breeding Systems—Fixing a Type—Crossbreds v. Merinos in Drought—Sheep and Crops on the Farm—Crop Rotations—Putting Sheep on to a Crop - - Pages 168 to 186

CHAPTER XII.

Fat Lamb Raising.

General Advice on the Care of the Flock—Which is the Best Cross ?—Merinos v. Half-breds or Three-quarter-breds—Qualifications of Various Crosses—Results of Lamb-breeding Trials—The Down Breeds—Use Good Rams—Marking Lambs—Best Type of Country for Lamb-breeding—Importance of Pasture—Condition of the Ewes—Classing and Mating—Weight of Lambs—Fecundity of Ewes—Growing Special Forage Crops—Rape and Mustard—Peas and Oats - · Pages 187 to 205

CHAPTER XIII.

Management of a Merino Flock.

Mating and Lambing.

Mating the Rams with the Ewes—Care of the Rams—Use Good Rams—Percentage of Rams—Rejoining Rams—Rigs—Yarding Ewes and Rams at Night—Breeding from Immature Ewes—Rams that Won't Work—Use of Drugs—Hand-serving—Stud Rams—Stud Ewes—Overworking Stud Rams—Treatment of In-lamb and Lambing Ewes—Spraying Ewes against Blowfly—General Notes on Lambing—Pastures—Water—Assistance to Ewes in Trouble—Ewes Slipping their Lambs—Lambing Ewes Cast—Pests at Lambing Time—Crows—Foxes—Fox-guard for Lambs
Pages 206 to 219

CHAPTER XIV.

Management of a Merino Flock (*continued*).

Lamb-marking and Shearing.

General Notes on Lamb-marking—Plan of Yards—Cleanliness in Tools—System of Age Ear-marking—Castrating—How to Hold the Lambs—Dressings—Tailing—Knife or Searing Iron—Mothering the Lambs—Marking Stud Lambs—Cleaning-up—Branding—Weaning—Shearing—Watering Yards—Cleaning the Shed—Blood Poisoning—Shearing Lambs—Stud Rams—Device to Assist Drafting into Shed—Shearers' and Shed Hands' Duties—The Skirting Tables Pages 220 to 234

CHAPTER XV.

MANAGEMENT OF A MERINO FLOCK (*continued*).

WOOL CLASSING AND DIPPING.

Preparing the Clip for Market—General Notes on Classing—Proper Designing of Shed—Classing Merino Wool—Fleeces—Keep Every Sort Even—Skirting Pieces—Crossbreds and Longwools—Fleeces—Pieces—Lamb's Wool—Do not Overclass—Rolling Fleeces—Light Weight Bales—Wool Pressing—Dumping—General Notes on Dipping—Its Advantages—Preparing and Mixing the Dip—Keep the Bath Stirred—Thorough Immersion Necessary—Drying the Sheep—Length of Fleece in Dipping—Precautions to be Observed—Spraying or "Jetting" Pages 235 to 251

CHAPTER XVI.

MANAGEMENT OF A MERINO FLOCK (*continued*).

SHEEP CLASSING.

General Notes—Adopting a Standard—What Constitutes a Good Ram—A Typical Ewe—Evenness—Culling—Crossbred Lambs from Cull Ewes—Culling for Age—Classing Yards—Judging a Sheep's Age by its Teeth—Differences of Opinion—Condition of Teeth largely Dependent on Feed and Soil Pages 252 to 264

CHAPTER XVII.

MANAGEMENT OF A MERINO FLOCK (*continued*).

DROUGHT MANAGEMENT.

Notes on Drought Management—Home Pastures and Agistment—Concentrate on the Breeding Stock—Conservation of Fodder—Variety in Feeding—Feeding off Withered Crops—Critical Time with Breeding Ewes—Weaning the Lambs—Licks for Starving Stock—Hand-Feeding with Wheat or Oats—Ration for Ewes—Constructing Feeding Troughs—Ensilage—Native Trees and Shrubs as Fodder—Salt Bush—Poisonous Plants—Variegated Thistle—Blue Couch—Treatment of Country after a Drought—Length of Time Sheep can Live Without Water Pages 265 to 279

CHAPTER XVIII.

THE BLOWFLY.

How to Tell a Blown Sheep—Varieties of Blowfly—The Sheep's Health and the Fly—Methods of Prevention—Dipping in Long Wool—The "Jet" System, commonly called "Spraying"—Description of Plant and General Hints as to how to Perform the Operation—Plan of "Spraying" Yard—Cage for "Spraying"—Care Necessary in Using Poisonous Dip—Crutching—The Chalcid Wasp—Arsenic for Poisoning—Must be Systematically Carried Out—Traps—Various Dressings—Dry Arsenical Powder Dip as a Preventive Pages 280 to 300

CHAPTER XIX.

STUD BREEDING.

Individuality—The Aim of Breeding—Starting a Stud—Purchasing a Sire—Character—Constitution—Introducing Fresh Blood—Where to Buy it ?—In-breeding — Line Breeding — Selection — Outcrossing — Reversion — Telegony—Stud Record Keeping—Systems of Breeding—Fold Development—Classing the Ram Lambs Pages 301 to 314

CHAPTER XX.

GENERAL NOTES ON SHEEP MANAGEMENT.

Lice in Sheep—Sheep Returning from Agistment Country—The Use of Dip against Lice—Stock in a Fire—Caught in Flood Waters—Grass Seed—Ophthalmia—General Notes on Sheep Dogs Pages 315 to 322

CHAPTER XXI.

DISEASES OF SHEEP.

Stomach Worms—Preventive Measures—Fencing off Swampy Country—Draining—Burning—Drenching—Recipes for Drenches—Specifics—Lung Worms—Intertracheal Injection—Drenching—Licks—Other Measures—Giddiness from Tape Worm—Footrot—Symptoms—Treatment—Paring—Footbaths—Hand Dressings—Anthrax Pages 323 to 336

CHAPTER XXII.

DISEASES OF SHEEP (*continued*).

Fluke—Symptoms—Preventive Measures—Drenches—" Black" Disease—Symptoms—Licks—Gangrenous Septicaemia—Symptoms—Treatment—Balanitis or Sore Pizzle—Causes—Treatment—Sickness in Lambing Ewes—Ante-partum Paralysis—Impaction—Sheep's Eyes Picked by Crows—Broken Legs—Garget—Maggots in the Horn—Hoven—"Aphis" Disease Pages 337 to 347

CHAPTER XXIII.

STATION MANAGEMENT.

RABBIT AND DINGO DESTRUCTION.

General Care of a Property—Painting—Rabbit Destruction—Digging Out—Using a Plough—Destroy Cover—Flooding Burrows with Bore Water—Fumigation—Poison Baits—Use of Phosphorus—Laying the Baits—Strychnine—Poisoning Water—To make Strychnine or Arsenic Water—Pit Traps—Trapping with Netting Yards—Tank Traps—Destroy all Carcases—Fumigation by Motor Exhaust—Dingo Destruction —Poisoning—Trapping—Gun Traps Pages 348 to 366

CHAPTER XXIV.

STATION MANAGEMENT (*continued*).

ENSILAGE, LUCERNE GROWING, ETC.

Ensilage—Cultivated Crops for Ensilage—Lucerne for Ensilage—Ensilage v. Hay—Making Pit Ensilage—Filling the Pit—Unloading the Drays—Covering the Pit—Use of Sledges—Locality of the Pit—Stack Ensilage—How much Ensilage should be given to Stock—Lucerne Growing—Making Lucerne Hay—Protecting Stacks—Protection against Mice—Bush Fires or Grass Fires—Fire Breaks—Beaters—Water Carts for Grass Fires—Burning Back to Meet a Fire—Appliance for Extinguishing Small Fires—Tree Fires Pages 367 to 380

CHAPTER XXV.

STATION MANAGEMENT (*continued*).

TREATMENT OF PASTURES, ETC.

General Notes on Indigenous Pasture Plants—Poisonous Plants—Darling Pea—Flat Milk Weed—Variegated Thistle—Wild Melon—Wild Tobacco—Trefoil—Spelling Pastures—Ideal Natural Pasture—Improving Native Pastures—Over-stocking—Allowing Grass to Seed—Advantages of Subdivision—Herbage—Getting Grass on Bare Patches—Artificial Grasses—Slaughtering Sheep — Skinning — Dressing—Drying Skins—Preserving Light Skins Pages 381 to 391

CHAPTER XXVI.

MISCELLANEOUS HINTS.

Poison for Eaglehawks — Poisoning Crows — Grasshoppers—Proportion of Dead Weight to Live Weight—Measuring Contents of Circular Tanks—Measuring a Haystack—Limewash Paint—Sorrel—Preserving Posts—Rain Gauge Pages 392 to 395

CHAPTER XXVII.

Acts and Regulations Affecting the Sheep Owner—Railway Regulations *re* Stock and Fodder—Taxation Returns—Land Laws—Arbitration Awards—Farmers' and Graziers' Associations—Stud Sheep Breeders' Associations—Conclusion Pages 396 to 399

Sheep, Farm and Station Management.

CHAPTER I.

Introductory.

General Introductory Notes—Gaining Experience—Advice to the "Jackeroo."

It may be said, without much fear of contradiction, that no industry has taken such an important part in the establishment and welfare of Australia and New Zealand as that of sheep husbandry, and that it will continue to play an all-important part for the rest of our days is just as certain. The people of the world must be clothed, and they must be fed, and substitutes notwithstanding, wool and mutton will always be two staple products for the fulfilment of these essential requirements. Naturally one of the first questions a young man asks himself when choosing a commercial path through life, is :—" Will it give me an adequate financial return for the investment of my capital and labour ? " The answer with regard to sheep raising is " Yes, if the aspirant to success has a natural aptitude for the business, if he has sufficient capital, if he is not afraid of work, if he has reasonable luck with regard to seasons, if he chooses suitable country and the right class of stock for it, and if he is not overburdened with inequitable taxation and ruined by antagonistic legislation."

The above conditions to success are somewhat numerous, and it may be well briefly to review them. Take the first. No man ever made a success of any venture where aptitude and keenness were wanting ; enthusiasm is a *sine qua non*, and the man who is lukewarm will never make headway against the trials, difficulties and discouragements which at times fall to the lot of every man who tackles sheep raising. It must be realised first and foremost that it means a life which, although healthy, interesting, and offering every prospect of a competence, is not a bed of roses. Of course, it does not mean the ceaseless grind of the dairy farmer, but there are at times severe trials and heart-breaking discouragements, which only a strong heart and sheer determination can conquer. With regard to the question of capital, this naturally depends on the size of the venture, although the beginner—for whom this book is primarily intended—will, after he has gained sufficient experience to enable him to make a start on his own account, usually begin in a comparatively small way. The capital required will depend on the choice of tenure, whether freehold, leasehold, etc., the locality of the property, the necessity or otherwise for improvements, the stock required, and so on. Here comes in the very important matter of choosing a suitable class of country and the right stock for it. There have been many disasters from mistakes made in this direction. Climatic conditions must be considered, the country must be sound and healthy, free from internal sheep parasites such as worms or fluke, it should be well watered either naturally or artificially, and it must carry the breed of sheep for which it is best suited, according to rainfall and pasture, whether wool and mutton growing, or fat lamb raising is intended, and so on. Success or failure depends very largely on this question of choice of country and stock, and every young sheep-man should, if possible, obtain the advice and assistance of an experienced and successful grower in making his decisions.

"If he has reasonable luck with regard to seasons" is another one of our conditions. and it is one that looms very large. So far, science has not discovered any reliable way of foretelling a drought, so that the best advice that can be given is always to be prepared as far as is possible for such a contingency. The control of rainfall is unfortunately a matter that is still beyond us, and drought is probably the most prolific source of ruin to which the sheep raiser is liable. In some localities it is possible to make certain provisions against drought by the conservation of fodder, but it is a regrettable fact that these precautions are far less frequently taken than they ought to be. On the other hand, conservation of fodder is out of the question on a great deal of country, and the occupier of such must put away a proportion of his profits in good years to tide him over the bad that will certainly come, and can only mitigate the evil by resolutely setting his face against the fatal practice of overstocking and by waging ceaseless war against the worst of all grass pirates—the rabbit. However, the subject of drought management of sheep is one which will be fully dealt with later on.

Finally, in the struggle for success, there are the influences of taxation and legislation. The former may be legitimate or inequitable, and the latter encouraging or the reverse, if not absolutely antagonistic. In Australia at any rate, it must be admitted that at the present day there is a distinct tendency to impose unfair taxation on the pastoral industry, while the legislation of the majority of the Governments appears to be designed with the direct object of benefiting the city dweller at the expense of the man on the land. However, the time is not far distant when Parliaments will realise what it seems incredible they have not discovered before, viz., that the solvency of the country depends almost entirely on primary production, and that if Australia is to avoid bankruptcy she must give first consideration to the producer instead of taking the money from his pockets to fill those of the worker in the big cities, thus fostering the greatest evil to which the Commonwealth is subject, that of centralisation.

Taking, then, all the above conditions into consideration, it may be said that, with the demand that must exist for food and clothing, combined with the general world shortage of domestic live stock that furnish such a large proportion of those two necessary commodities, the prospects of success offered by the woolgrowing and sheep-raising industries are bright enough. It is one of the healthiest and cleanest of all professions, those who adopt it are performing service of national importance, and provided aptitude, practical knowledge and experience, and the will to succeed are brought to bear on it, and it receives its due meed of Governmental assistance and encouragement, it must benefit the nation as a whole, and will ensure a competence for the individual who enters its ranks.

Before taking up country, and becoming actual sheep farmers on their own account, it is essential that a thorough working knowledge—gained under practical conditions—of sheep and station management should be acquired by men who have chosen the profession with which we are dealing. A course at one of the Government agricultural colleges will furnish some useful groundwork, more particularly for the man who intends taking up mixed farming or fat lamb raising, but the best school for the embryo grazier is the sheep station, where he will gain his knowledge under "active service" conditions. Of course, many a young man, born on his father's property, is in a pastoral school, so to speak, from his cradle upwards, and we can safely leave his "jackerooing" in his own hands and those of the man who has already made a success of the business before him, and will eventually give his son a good start along the same road The boy, however, who has no such advantages, has a different row to hoe, and it is for him it is hoped that the following advice regarding the gaining of his station experience will prove of value. Whether his first step along the road of pastoral pursuits will prove a success or not depends on himself and the manager or owner to whom he becomes "apprenticed." A patient and sympathetic "boss" will be an invaluable mentor to the young jackeroo, but unless the latter possesses the attributes of keenness, common sense and anxiety to learn, an angel from heaven in managerial guise could not lick him into a shape that would give promise of success, when ultimately his own boss.

The following hints to jackeroos by a well-known manager of various big stations in New South Wales are well worth studying. He says :—"Young men going to stations to gain experience must realise that for a commencement at least they are of very little value, and are only tolerated by the managers because they may help in the yards, or in the shed at shearing, or more often because they were sent up by the owner and a place has therefore to be found for them. An experienced man, or jackeroo as he is most often called, as a rule gets some salary, although, generally, he isn't worth much. His first work on a station will perhaps be to run up the horses, and a cold job it is on a winter's morning, as the horses must be yarded by 7 a.m. or earlier in busy times ; so this morning ride more often than not starts before daylight. Other work will probably include helping to repair fences and yards, or mustering sheep, drafting, and so on. After a few weeks the jackeroo will be trusted alone to do odds and ends of station work, and with one or two years' experience he will be equal to taking a junior overseer's position, provided he has learnt to draft and count sheep. Later on he will be made head overseer with control over the hands and general work of the station. A fully qualified overseer should be equal to managing the property he is working on, and provided he is sober, smart, and a good worker he will sooner or later get to the top of the tree and secure a management. The jackeroo starting at perhaps seventeen or eighteen years of age, quite expects to be a manager within a few years. If he reaches the desired goal within ten he may count himself very fortunate. My advice to young men is to get into a company's service if possible. In private service the owner, as likely as not, has a son or a nephew growing up to take over the management from the man who has taught him."

This same manager, who has been through the mill himself, and in turn has helped many others through it, gives the following "dont's" for the jackeroo :—

Don't get into the habit of hanging on to your bed to the last possible moment in the morning.

Don't be too free in offering advice to your seniors.

Don't stand about with your hands in your pockets and see others breaking their hearts over work where assistance is badly wanted Lend a helping hand every time you get the opportunity.

Don't make an enemy if you can possibly avoid it, for that man may do your future a lot of harm. The gentle art of making enemies must be avoided by the jackeroo.

Don't try too hard to justify an action when admonished by those over you. They know you have done wrong, and you, perhaps, don't.

Don't use bad language. You will hear lots of it from men who should know better, but it is a horribly degrading habit, to be avoided under any provocation.

Don't over-ride or over-drive the station horses. Young men are very apt to do this. If you do not consider the beasts from a humane point of view, remember at least that they are not yours, and be considerate accordingly.

Don't over-drive the sheep when mustering and bringing them to or taking from the yards. Keep your dog, and your whip, and yourself in check always.

Never stand by and watch other people working. If you are too tired to help, get away. A common expression in the bush is "that's not my work," and the man who uses it is not worth his salt.

Remember that your future success or otherwise largely depends upon the impression you make on the managers and overseers you may serve under. To do your work conscientiously and well is not everything. You must cultivate the friendship of those with whom you come in contact, and those bush friendships will serve you sooner or later.

Don't think because you are set to do one kind of uncongenial work, or live at a lonely outstation, or camp out for a considerable time, that you are wasting your time, or that you are forgotten, or that your valuable services are not appreciated at their full worth.

Don't worry about trifles Remember that youth is on your side, and that youth will be served. Go right on with whatever work is given you, and be cheerful about it. If you are doing your best, sooner or later that best, if good enough, will be satisfactorily recognised.

And one last "don't"—

"Don't drink spirituous liquor until you are thirty, and all you drink after that won't hurt you." That is the advice of one of the leading pastoralists of Australia. Drink is the curse of many bushmen, and a taste for it is the greatest handicap a young man can have. Its abuse is responsible for the early death of thousands in Australia, and it is certainly the greatest risk that the jackeroo has to face.

CHAPTER II.

PERMANENT IMPROVEMENTS.

WATER SUPPLY AND TIMBER DESTRUCTION.

Water Supply—Excavated Tanks—Elevated Supply Tanks and Troughing—Ring or Mallee Nest Tanks—Clay Tanks—Brick and Cement Tanks—Repairing Iron Tanks—Reinforced Concrete Tanks—Wells and Sub-artesian Bores—Overshot Dams—Timber Dams—Artesian Bores—Drains—Hydraulic Ram—Ring-barking and Timber Destruction—Use of Explosives—Use of Chemicals—Plantations.

Assuming the land has been secured, the next question to be considered is that of improvements. These may have been effected already by a previous owner or lessee, but the man who has to lick a property into shape from the rough will find ample work to occupy his time, such as the ensuring of water supply, erection of fencing, ring-barking, etc.

As to whether the land is freehold or leasehold makes a difference, because with the former more extensive and permanent improvements enhancing the unearned increment of the land would be undertaken. Under a Crown leasehold tenure, these improvements would only be effected when really necessary, and at a minimum of expense consistent with a maximum amount of efficiency. Any money sunk in improvements under the leasehold tenure is speculative, whereas under the freehold title, unless the land is compulsorily resumed, the landowner can demand his own terms, and is free to bargain as best suits him.

WATER SUPPLY.

It is practically impossible to lay down hard and fast rules of management under the great variety of conditions of climate and soil obtaining over such a vast area of country as Australia, so that it will be best to deal individually with the different items that may be said to come under the heading of improvements. In the hot, dry parts, the all-important item that the stock raiser has to be sure of is water, which must be secured, at no matter what cost, before it is safe to put stock on the run. Probably, excavations made in the ground—known in Australia as tanks—are the most universal method employed. Wells, where water can be obtained at a reasonable depth, have advantages over tanks, in that they cost less and are more permanent. Dams of approved construction are useful for backing up streams. Artesian bores, as far as Australia is concerned, are restricted to the artesian belt running through Western Queensland, North-west New South Wales, parts of South Australia, and of Western Australia. The work of sinking these is generally done by boring contractors. Sub-artesian water is found in most countries, and where the rainfall is too light and irregular to ensure a permanent surface supply, is often the only means of watering the stock during the greater part of the year. Sub-artesian water, like true artesian, is tapped by boring, but differs from it in that the water is found at a lesser depth—generally from 100 to 400 ft.—and seldom rises to the surface. Windmills are used largely for lifting water from wells, bores and excavated tanks into elevated supply tanks, from which it may be drawn off by gravitation.

TANKS.

When choosing the site for a tank the two main considerations to keep in view are, first, to make the excavation in such a position that it will drain the largest possible catchment, and, second, to so locate it that it will be easy of access to stock. If surveyor's instruments are not handy, or the working of them is not understood, it is a good idea to go out while it is raining to see which way the water runs best, where the deepest parts are for drains, and stick in a number of pegs roughly. It can then be properly pegged out when the weather is dry. Naturally the selection of a tank site depends a good deal on local conditions, and of course, the better the catchment the less excavation is necessary. Again size and capacity are governed by the size of the catchment area, rainfall and needs of stock, and it should always be borne in mind that the less surface exposed to the sun's rays, the less will be the evaporation and consequent loss just when the water is most wanted, so that a good depth will be seen to be a distinct advantage. Under ordinary conditions 12 ft. to 13 ft. deep will be found about right. The slopes down which stock move to water must also be carefully considered, and probably 2½ to 1 is suitable, although we commonly see 3 to 1 used. Before starting to excavate it is advisable to sink a shaft at each corner to the full depth, in order to see that the soil is free from veins of "drift"; if this is not done, just as the tank is getting towards completion, it may have to be abandoned by reason of drift, which leaks like a sieve, so that to avoid heavy expense another site has to be chosen. In paddocks of any size, at least two watering places should be provided, so that stock can feed to and fro between the waters. With only one tank or well, the sheep must cover a lot of unnecessary ground in getting to water, especially in hot weather.

TABLE SHOWING THE SURFACE AREA, &C., OF SQUARE TANKS WITH CAPACITY VARYING FROM 2000 TO 12,000 CUBIC YARDS AND SLOPING SIDES OF 1 IN 2, 1 IN 2½, 1 IN 3. THE CALCULATIONS ARE BASED IN ALL CASES ON A UNIFORM DEPTH OF 12 FT.

CAPACITY. Cubic Yards.	BATTERS of all Four Sides.	DEPTH. Feet.	SURFACE AREA. Length and Breadth in feet.	BOTTOM AREA. Length and Breadth in feet.
2,000	1 in 2	12 feet.	89.63	41.63
	1 in 2½		94.80	34.80
	1 in 3		99.78	27.78
3,000	1 in 2		104.98	56.98
	1 in 2½		110.31	50.31
	1 in 3		115.49	43.49
4,000	1 in 2		117.85	69.85
	1 in 2½		123.27	63.27
	1 in 3		128.56	56.56
5,000	1 in 2		129.15	81.15
	1 in 2½		134.64	74.64
	1 in 3		140.01	68.01
6,000	1 in 2		139.36	91.36
	1 in 2½		144.89	84.89
	1 in 3		150.31	78.31
7,000	1 in 2		148.73	100.73
	1 in 2½		154.30	94.30
	1 in 3		159.77	87.77
8,000	1 in 2		157.44	109.44
	1 in 2½		163.04	103.04
	1 in 3		168.54	96.54
9,000	1 in 2		165.62	117.62
	1 in 2½		171.24	111.24
	1 in 3		176.78	104.78
10,000	1 in 2		173.36	125.36
	1 in 2½		179.00	119.00
	1 in 3		184.55	112.55
11,000	1 in 2		180.71	132.71
	1 in 2½		186.36	126.36
	1 in 3		191.94	119.94
12,000	1 in 2		187.73	139.73
	1 in 2½		193.40	133.40
	1 in 3		199.00	127.00

The method of construction varies. The best work can be done with a pick and shovel, but then the cost is almost prohibitive, owing to the scarcity and dearness of labour. In Australia the plough and scoop is most favoured, the necessary implements being easily obtainable on the market. The excavated earth may be formed into a bank round the tank, but on no account should it be left within 20 ft. of the edge. There ought to be a flat and undisturbed space 6 or 7 yards wide right round the tank.

The drains need to be ample and kept in good order. One expert estimates ½ mile of drains in a good catchment for every 1000 yards of excavation; if not good, 1 mile to every 1000 yards, and so on, but this is only rough. The drains should not be too deep, and if the lay of the land has been carefully observed and pegged out during wet weather there should be no difficulty in deciding where to cut them. The simplest method of construction is to plough two or three furrows and clean the earth out with a small drain scoop. With a good catchment the main drain will probably need to be 6 inches deep and 2 ft. 6 in. wide. One, or more, plough furrows will do for feeders. Small drains can be cut by means of a plough with a double mouldboard, although patent delvers for this sort of work have recently been placed on the market. The earth from the drains should be banked up some 6 inches from the side of the cutting on the downhill side. A great deal can be done in this way to get the drains to run well. Where the main drains enter the tank the batter must be well and securely aproned right down to the bottom.

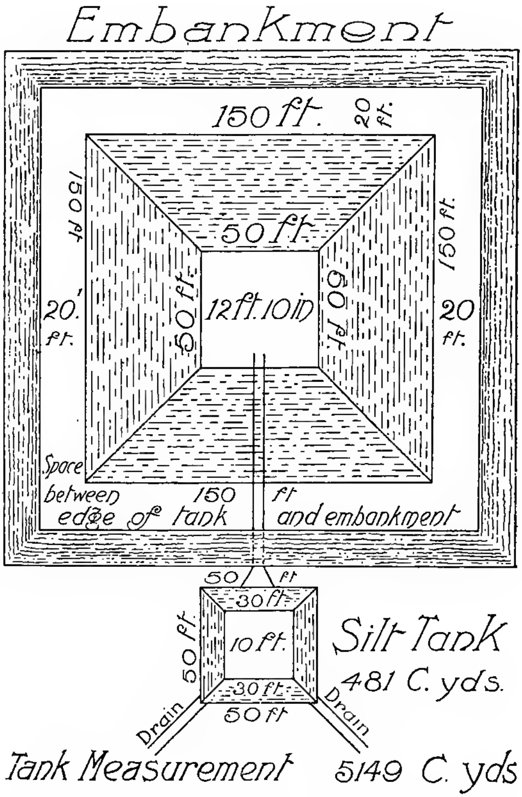
In districts where silt collects, it is advisable to construct a silt tank, as shown in the diagram on the following page.

The silt tank should be about 10 per cent. of the capacity of the main excavation, with which it is connected by means of a chute. All the drains run into the silt tank, where the suspended matter settles, and the water passes on to the main tank. The portion of the chute that pierces the embankment is covered, the balance is open fluming, 2 ft. x 2 ft., and the water is carried right into the centre of the large tank, thus saving the sides and preventing scouring.

Tanks constructed on the foregoing lines should be to all intents and purposes permanent, especially so if stock are kept out of them. The drains must be kept clean, and it may occasionally be found necessary, say, once in ten years, to clean the tank bed out, this usually being done with scoops. Many practical men will not allow stock to enter this class of tank to water. The most satisfactory method is to lift the water into galvanised iron supply tanks by means of a windmill, and draw off into troughing.

The usual thing is to have one or more tanks placed on stands close to the windmill or pump, and the troughing connected therewith by pipes, the flow being regulated by means of a ball tap.

No definite rule can be laid down as to size of supply tank. That depends on troughing to be supplied, stock to be watered, climate, etc. Speaking generally, however, the tank should have a capacity of at least 10,000 gallons, except on a very small property. Circular tanks built of corrugated galvanised iron, say 22 or 24 gauge, are the best. The size determined, the next step is to prepare a stand. Often tanks are built on a wooden platform raised some 2 ft. off the ground, and supported on piles 2 ft. apart. The risk, however, of piles sinking or rotting, and so throwing the bottom of the tank off the level, is so great that this method is deprecated. Earth or sand and a few logs make what is probably the best platform obtainable, and certainly the cheapest.



PLAN OF TANK AND SILT TANK (see previous page).

TABLE SHOWING THE DIMENSIONS OF CIRCULAR TANKS OF VARIOUS CAPACITIES, ALSO THE QUANTITIES OF GALVANISED IRON REQUIRED.

Capacity in Gallons.	DIMENSIONS.				MATERIALS REQUIRED.							
	Diam.	Circum.	Surface Area.	Height.	Sheets of Galv. Corrugated Iron for Sides.					Sheets of Plain Galv. Iron for Bottom.		
					10 ft.	9 ft.	8 ft.	7 ft.	6 ft.	6 x 3 ft.	6 x 2½ ft.	6 x 2 ft.
	ft.	ft.	sq. ft.									
1,999	8¼	25.92	53.46	6 feet.	—	9	—	—	—	3	1	—
2,379	9	28.29	63.65		—	6	—	—	6	—	3	3
2,937	10	31.43	78.57		—	9	—	—	3	2	4	—
3,554	11	34.58	95.07		—	12	—	—	—	—	8	—
4,229	12	37.72	113.14		9	3	—	—	—	6	2	—
4,964	13	40.86	132.78		—	12	—	3	—	9	—	—
5,757	14	44.00	154.00		12	—	—	—	3	10	—	2
6,608	15	47.14	176.78		12	3	—	—	—	12	—	—
7,519	16	50.28	201.14		—	15	3	—	—	12	2	—
8,488	17	53.43	227.07		12	—	6	—	—	8	9	—
9,516	18	56.57	254.57		15	3	—	—	—	11	—	10
10,603	19	59.71	283.63		—	18	3	—	—	11	10	—
11,748	20	62.86	314.28		6	15	—	—	—	—	18	12

The mode of constructing a permanent earth stand and building the tank (unless it is preferred to purchase the latter already made) is as follows:—Say the diameter of the proposed tank will be 20 ft. Drive a peg in where the centre will rest, leaving it the height of the stand (2 ft. or 2 ft. 6 in. is generally enough), and from this measure off about 11 ft. to eight equi-distant points, driving a peg in at each. Fill this space with soil to the required height, using, if it is possible to obtain it, rubble for the foundation, but taking care to have the top free from stone. Round the outside of the mound, and between the eight pegs, lay eight logs about 8 in. in diameter, bevelling the ends so that each will fit flush into the other at the pegs. The logs must be clamped together with iron dogs, and built up underneath, so that the tops will come flush with level of the centre peg. This done, the mound can be stamped down and levelled off, any surplus earth being neatly packed round the outside to form a batter.

As soon as the stand is finished the building of the tank can be proceeded with. First a sheet of tarred felt should be spread over the top of the mound, and on this the flat tank bottom is laid and cut to size. The tank is then built up in the usual way. To make a strong job it is advisable to use screw bolts and nuts for joints and pack them with blanket soaked in red oxide. Washers are not required. Sheets of corrugated iron should overlap 3 to 6 in., with a double row of bolts in heading or perpendicular joints.

Bolts, or rivets, if used, should be about 6 in. apart. Solder need be used only on the bottom, and to fix the bottom to the first ring, all the other joints being packed and screwed as described. (Some men prefer to use solder throughout.) It will probably be found that the oxide joints will weep at first, but if they are tightly screwed up that will soon cease. When completed, the tank, both inside and out, should be well coated with coal tar. It is advisable to strengthen the structure by putting a ring of light angle iron around the top corrugation For stays, put a post about 6 in. in diameter at the join of each of the eight logs on the inside of the angle. These should project about 1 ft. above the tank, and be tied across the top (not too tightly) with No. 8 wire. Besides staying the tank, these posts help it to settle down on an even base as it fills with water.

Ring or Mallee Nest Tanks.

Ring, or Mallee Nest tanks as they are sometimes called, are frequently used on country that is suitable. Soft, black ground is too porous, but where red soil is available they hold water well, and the cost per gallon held is very small by comparison with the cost of iron tanks. A station manager who has had considerable experience of ring tanks gives the following particulars :—

Height of bank, 7½ ft. ; height, ground to overflow pipe, 7 ft. ; slope, 4 to 1 inside and outside. If ground is likely to be sloppy when holding water, an inside slope of 5 or 6 to 1 would be better than 4 to 1. Diameter at bottom—Inside measurement, 12 ft. ; outside to outside (with 4 to 1 slope), 132 ft. Contents to overflow pipe (with 4 to 1 slope), 53,000 gallons. A tank of this kind will contain in its bank 1000 cubic yards of earth.

The best way is to run the piping from the pump 6 inches under ground, right to the centre of the tank to be made. At this end, an elbow is screwed on when the tank is finished, and a stand pipe 24 inches long is screwed into this elbow, coming up about 21 inches in the centre of the tank. This pipe acts as an inlet pipe as well as an outlet, and its rising well above the bottom of the tank prevents dirty water coming through into the troughing. The underground pipe is tapped where required to fill the troughing, and the supply is regulated by a ball cock in the ordinary way. The overflow is provided for also by tapping the underground pipe and screwing in a piece of piping the required height. This piece has an elbow screwed on top, and empties into a small drain made to convey the surplus water where required. At both places where the pipe is tapped a T-piece is used to make the required unions. It is very important to thoroughly plough the ground on which the tank is to be made. This will insure freedom from leakage.

Ring tanks are used in connection with holding stock water lifted from wells, and would not be suitable, as a general rule, for domestic purposes. Once they are filled, it is advisable to keep them so to prevent any risk of cracks developing that might cause serious loss of water at a time when urgently needed. Of course it is necessary to clean them out about twice a year, when they are not in use. If the water from the wells is brackish or otherwise highly mineralised, cleaning out is important, because well water which may become stagnant is unsuitable for any class of stock.

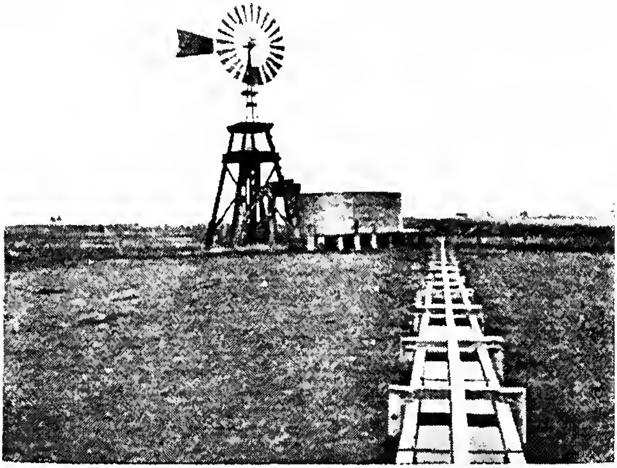
When putting up one of these tanks, the earth required should be taken from an excavation near by, which can be used to hold the surplus water after the tank is filled. This surplus should be fenced so as to force the stock to use water from troughing erected in connection with the tank, and only made available for stock when the supply in the tank runs out, which happens occasionally when windless days are experienced at wells where only a windmill is used for lifting water.

When making a Ring tank it is advisable to use horses or bullocks in putting the earth into place, as they tramp the earth work, and this makes the tank hold well. To prevent erosion of bank, it is advisable to sow couch grass on the banks as soon as they settle down, and to assure the full height of the bank being maintained i is necessary to make it a full twelve inches higher than the specifications, whatever may be called for. Measurements should be over rather than under, in every direction, as all earth work settles considerably. The nature of the soil used must not be overlooked, for if it is of a crumbly nature there would be a risk of the bank breaking away if the width were too light, and this might happen at a time when the water was most urgently needed.

If these tanks are erected in rabbit-infested country, it is advisable to wire-net the fencing.

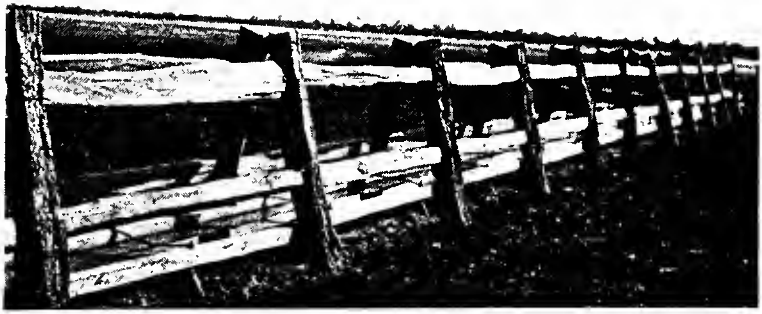
TROUGHING.

Troughing can be bought ready made, or be put together on the property. Twenty-two or twenty-four gauge plain flat galvanised iron is the best material to use. The joints can be packed and screw-bolted in the same way as the tank. One hundred feet is usually long enough for any one trough, although there is no reason why there should not be several such lengths fed from one tank. If of too great a length, the water is liable to get warm and stale. The law of gravitation is the only limit to the distance troughs may be from the supply tank. Wood is substituted for iron occasionally, in places where the well water is very corrosive. All troughing should be protected in some way to prevent stock



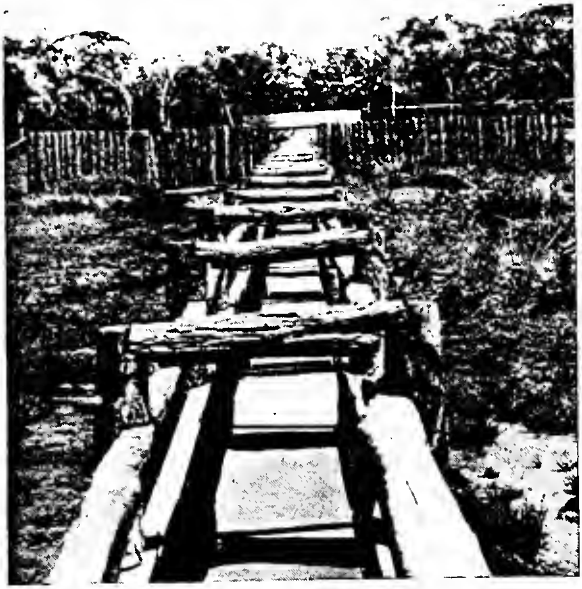
Troughing Protected against Stock.

from getting into it. Pictures published herewith show how this may be done.



Trough Protected by a Double Fence (Unnecessarily Heavy unless Cattle and Horses Water with the Sheep).

Another method is to put in a row of hardwood posts (if split, trim off the splinters) 2 ft. in the ground and 10 ft. apart, as close as possible alongside the troughing, with a strainer 3 ft. in the ground at each end. Have the posts high enough to allow a No. 6 galvanised wire to be run through, so that the wire will be 16 in. above the top of the troughing. Place a good stay at each end, mortised into the strainer, and strain tightly. The wire so placed will allow sheep to drink under and big stock over the wire.



TROUGH PROTECTED WITH HEAVY RAILS.

If stock are to drink on each side of the troughing have the guard on each side.

If possible, put the troughing on hard ground, as otherwise the earth all round will rapidly get into a badly bogged state. Should hard ground not be available, rough stone pitching or corduroying for about 6 ft. on each side of the troughs is strongly recommended.

Troughs should be frequently cleaned out when in use, and a partly-worn house or woolshed broom is excellent for the purpose, and one should be supplied for use at every watering place where troughs are used. All well water deposits a considerable quantity of matter in troughing, and the sheep add to it, hence the need of frequent cleansing. Sheep are very particular about water, when there is plenty of it, and they have a particular objection to dirty troughs.

Brick and Cement Tanks.

Before leaving the subject of tanks, it may be mentioned here that the recent shortage and high price of galvanised iron, due to the war, created a strong demand for a substitute of some sort for iron tanks. Many men get over the difficulty by constructing tanks of clay, worked into a pug and inserted between two frames of timber. These are said to hold water well, and satisfactorily answer the purpose of an iron tank, besides being cheap and easy to construct. Another cheap and good substitute is one constructed of bricks and cement, and holding about 9000 gallons. It should measure 14 ft. 3 in. diameter, by a depth of 9 ft. on the inside. A foundation 9 in. in depth should be dug out and filled with concrete to a depth of 5 in. That should be covered over with straps of wire from the centre to the circumference, the ends being turned up, and then another 4 in. of concrete put in. One row of a 9-in. brick wall should be laid and then a 4½-in row, or a single brick all the way, and held together with three parts sand and one of cement. When the wall has been completed, three bands of pig netting (150 yards) should be laid around the tank and tightened with a wire strainer. Then nine rows of No. 8 wire should be placed in the same way, and the zig-zag should be pulled to take up the slack. The wire should be flushed up with five of fine gravel and one of cement, and again with five of sand and one of cement. About 1 in. of cement concrete should then be put in (3 to 1), and it should be plastered with a mixture of two of fine sand and one of cement. The quantities would be approximately :—2200 bricks, 10 bags cement, 50 yards netting, ½ cwt. wire, four bags lime, four loads gravel, two loads of sand.

Repairing Old Tanks.

Finally, it is not generally known that iron tanks beyond repair, as far as the plumber is concerned, can be made to hold water by the use of ordinary cement. The tank can be reinforced with wire netting fastened on the inside and then covered with concrete, or else the netting may be omitted. First of all carefully clean off all grease, mud and scale on the inside, but do not rub too hard, or the holes will be enlarged. Any holes larger than about a quarter of an inch should be covered on the inside with small pieces of tin or galvanised iron, lightly affixed, as the cement itself will eventually hold them firmly in position. Small holes such as pin holes need not be covered.

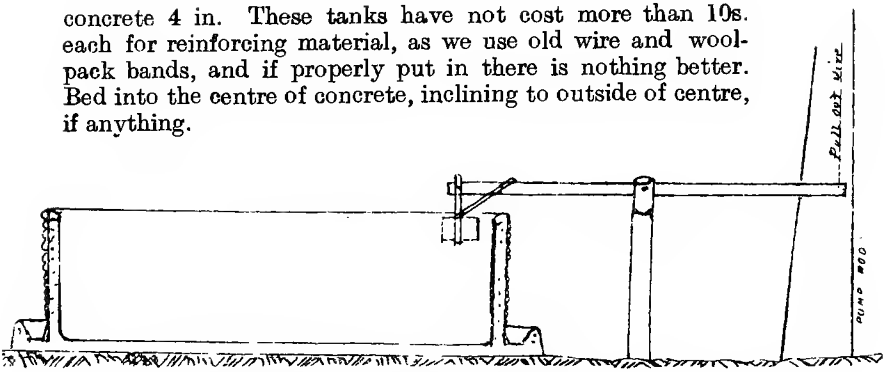
When this is done prepare a wash of pure cement and water about the thickness of cream, and lay it on with a brush, covering only about one-third in depth of the tank at one time (beginning at the top). While this wash is still moist cover the sides of the tank with a composition of one part cement and two parts sand, which must be free from dirt, fill up all the corrugations in this way, and continue the operation until the whole of tank from top to bottom is made quite level on the face ; that is, until the whole of the corrugations are filled. Then start again at the top and lay on a coat one-half inch thick of cement compo, made in the proportion of one of cement to one and a half of sand, rule it off vertically with a straight-edge, and finish with a wood float, rubbing it until a hard surface is obtained ; if preferred a steel float or a trowel may be used for finishing, which will give a polished surface.

When the sides are finished cover the bottom with a three-quarter inch coat of the cement, and one and a half of sand. Put a small fillet all round at the intersection of the sides and bottom, allow to stand for two days, then it will be ready for use, and will outlast any other tank not so treated. As the iron is not absorbent the work should not be done too hurriedly, and should small cracks be noticed after a day or two, they can easily be filled in by a wash of cement. Also, the cement can be given a coat of coal tar and oil, and the outside of the tank a coat of coal tar alone.

It may be asked whether, when the work is dry, the contraction and expansion of the iron may not cause serious cracks in the concrete, thus causing loss or damage to stock depending upon a supply of water which failed at a critical moment, but the answer is that the expansion and contraction of cement concrete and iron are practically the same ; a factor in favour of using this method for tanks is that they are usually circular, and this shape is not so subject to expansion and contraction in the same ratio as the longitudinal structure would be. The same system can be successfully adopted in repairing sheep troughing.

Reinforced Concrete Tanks.

Again, another method of making reinforced concrete tanks, as described by Mr. J. Muir Dick, a Western Australian grazier, is as follows :—" We use for the mould or inside ring an old Squatter's tank, and the existing corrugated tank as outer ring. Our tanks average 14 ft. diameter by 4 ft. 6 in. high, and the thickness of concrete 4 in. These tanks have not cost more than 10s. each for reinforcing material, as we use old wire and woolpack bands, and if properly put in there is nothing better. Bed into the centre of concrete, inclining to outside of centre, if anything.



Reinforced Concrete Tank Section and Circular Trough, with Simple Device for Shutting off Mill.

(Invented by Mr. W. Withnell, of Karratha, Roeburne, W.A. The float is an ordinary oil or naphtha drum.)

"The next important part is gauging and mixing. Get a box measuring 12 in. every way inside. Take four of this 1½-in. gauge metal downward, four of sand, and one cement; if the sand is clean, sharp sand, one is sufficient, but if it is fine, inclining to loamy, put 1¼ boxes of cement. Now comes the most important part, viz., the mixing, as the material can hardly be too well mixed. Three times dry should do, but see that there are no streaks of sand showing, then twice wet. Spray water from a watering can as it is being turned over, but never have water running away from the heap. Keep working all the time, and putting into mould, and if rightly mixed it should have a sort of springy feel, in which form it will almost set itself, and need very little ramming.

"In order not to disturb the mould use a round rod to pack the concrete; this will soon exclude all the air, and water comes to the surface freely. To stay our improvised mould corrugated sheets are held up against sheets of mould by wire going from inside to outside, and when removing the mould cut the wire close to the concrete. We remove the inside ring about eighteen to twenty hours after finishing, and paint over with a cement and water mixture about as thick as treacle. As soon as this paint or wash is dry, slowly fill with watre. This is exactly as we have done, and the tanks are a great success.

"In most cases the old tank is completely riddled with holes. Where a hole is very large, necessitating a patch, when the concrete is up to the hole, stick a piece of iron sufficient to cover same behind the concrete, and pack up with a little more to hold in position. This is all that is required, the packing down of concrete forcing the patch out against the old tank.

"The sketch shows tank and circular trough near mill. There appears to be nothing to beat the circular trough, no jumping over and dirtying the water, and no dead sheep in the troughs. The water is always cool, with a great portion of it in the shade: some part is always shaded, and with a flat bottom sheep and lambs can get a footing to jump out. After about two years in use none have been found dead in the trough."

BORING.

Where water can be obtained at a reasonable depth, wells and sub-artesian bores are generally to be preferred to excavated tanks. The initial cost is usually no greater, neither is the upkeep. The site should be chosen with care, and the supply tapped where it can be utilised to the best advantage. Commonly there are two methods of reaching the water. The oldest is by sinking a timber-lined shaft, but for obvious reasons this is only practicable where the depth is not great, say, not more than 100 ft. Latterly, boring has come more into vogue, and this method is now usually recommended. Plants which will bore to a depth of 400 ft. can be obtained at a reasonable cost, besides which there are contractors who undertake this class of work, and also, apart from the question of cost, bores have a great pull over shafts in that the casing shuts out deleterious matter, sand, etc., from the drinking supply.

When pumping first commences after the wells have been out of service for any considerable time, the first half day's pumping should be run off, because water standing in the shafts frequently becomes more or less poisonous for stock, being too heavily charged with minerals.

When pumping is completed, all tools, etc., should be collected and removed for safety, and in the case of deep wells, where heavy columns or piping is used, the lengths in the water should be unscrewed and removed, as mineralised water eats iron away very quickly. All piping, after being used, should be cleaned inside and out, and then well tarred, to prevent rust. Iron supply tanks and troughs at wells also need care by annual coats of paint or tar. Where excavations are used for supply they should be sunk well away from the shafts, otherwise water may soak back from the excavations into the shafts and rot the timber.

Underground water can be located by what is known as the divining rod. Opinion is somewhat divided as to the efficacy of this method, but innumerable trials, the accuracy of which has been proved by subsequent boring, show that more often than not it can be successfully practised. "Divining" has always been somewhat of a mystery, and there is a tendency to regard it as a "quack" practice, but quite recently experiments have been carried out by a well-known London scientist, at the instance of Mr. Thos. Robertson, Mt Mitchell, Victoria, which have solved the problem. It is too abstruse a matter for discussion here, concerning "atomic force," "molecular energy," and other scientific subjects, but it has been proved beyond doubt that "divining" is really no mystery at all, but that it is based on natural laws.

True artesian water, where available, is perhaps the best of all methods of obtaining a permanent artificial supply. In Australia there is a well-defined belt, which embraces Western Queensland and North-Western New South Wales. In these two States alone there were in 1918 approximately 1600 artesian bores flowing, producing, together with sub-artesian and pumped supplies, a daily aggregate flow of something like 500,000,000 gallons. In addition, true artesian water is found in parts of Western Australia and South Australia.

The mode of tapping it is the same in all cases, *i.e.*, by boring into the water-bearing strata. The depth at which it is found varies from 1000 to over 4000 ft., in fact, one bore in Queensland was recently sunk to over 6700 ft.; and the flow may be anything up to 4,000,000 gallons per day, according to locality. As the plant capable of boring to the necessary depth is expensive, the work is usually done by contract.

For watering stock, drains are run out from the bore for 10, 20, or even 30 miles. The flow down these can be regulated to a nicety if the levels have been carefully taken and the bore site well chosen. The site of the drains depends on the flow. In most classes of country they can be cut by means of deep ploughing, the earth being removed by a delver. As the channels usually run through open paddocks, where stock are allowed to water at will, they require constant attention to keep them clean. A handy implement, however, has recently been put on the market, which it is claimed will keep drains free from Nardoo, Couch Grass, and Maranda, three troublesome pests, and which will also make new drains without the aid of a plough.

There is skill in properly surveying and making drains, which can only be acquired by experience. If the flow is small, and not sufficient to water the stock, and at the same time allow some irrigation to be done, a very good plan is to construct some small tanks and fill them as required by a bore drain. Make plenty of small bridges over the drains with any old rails or other waste timber, as plenty of these avoid breaking the banks in crossing the drains with buggies, &c. If any watercourses are on the place, these can be filled with the bore water, but they will get full of rushes, which cannot be got out again except by drying the water off and burning. On a small property by systematic working the drains can be kept free of rushes. Have a good man on them all the time when first put down pulling out the rushes when they first show up, and again and again until all the seed that was in that drain has germinated, and no more can get down through the water. Also by carefully looking after the drains in this way, and keeping them clean, the couch grass will grow along the banks and a perfect drain is the result.

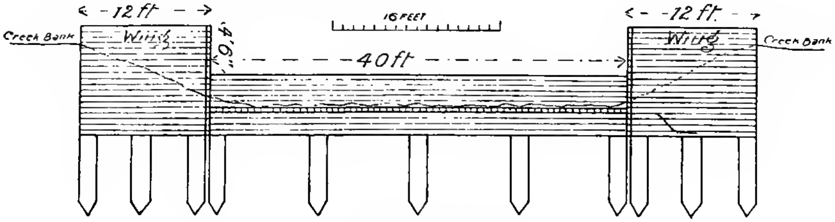
DAMS.

The ordinary dam, comprising a bar of earth, timber or stone, thrown across a watercourse, and protected with a bywash, is still a common method of conserving water. It is certainly cheap, but generally speaking, except in districts blessed with a regular rainfall, the supply is necessarily uncertain. and there is also a danger of the by-wash cutting away during floods.

In fact, if dams are to be made at any great expense where a heavy volume of water is to be held up, it is best to get the advice of an engineer, especially in snow or mountainous country. As a general rule, dams are to be avoided where good tanks can be put down; the latter run no risk from floods, and hold a greater amount of water in a given space, thus losing less from evaporation.

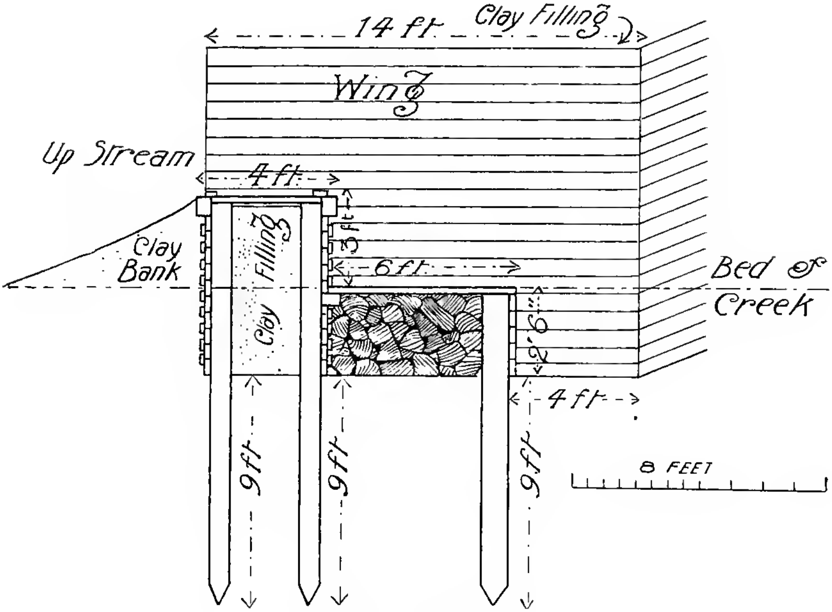
Overshot dams have much to recommend them. They are really high weirs, and are constructed by building a brick, stone, or wooden wall, backed with earth, across the watercourse. As with a weir, the water simply flows over the sill, the down-stream side being protected with stone pitching or cribwork to prevent scouring.

Working drawings of one class of overshot dam are given herewith and on the following page.

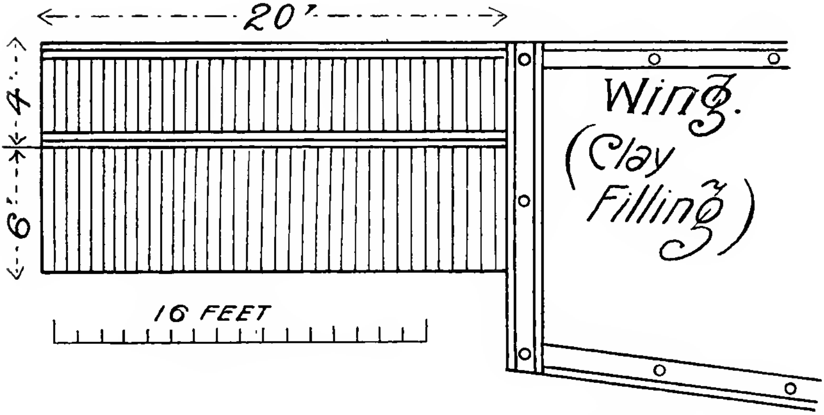


OVERSHOT DAM.

FRONT ELEVATION, LOOKING UP STREAM.



Cross Section.



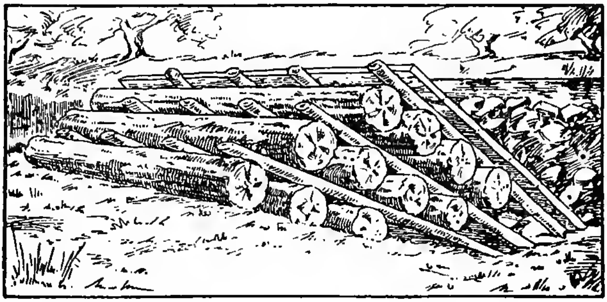
Ground Plan, showing Construction of Wing.

Overshot Dam (see previous page).

Overshot dams built on this or a similar principle will hold up any usually slow running stream with a good clay bottom, and will require little attention to keep in order. Of course, the details of construction would need to be altered to suit local conditions. The dam shown in the drawings is built throughout of sawn timber, but if suitable rough timber is available, it might be used for the posts; 2-in. planking is used for the wing and face of the dam. The filling must depend on the material available. Stone makes the best, but then as often as not stone is not at hand. Clay, logs, brushwood, or even bags of sand are sometimes used.

The choice of site, the height and materials to be used, are points which have to be settled independently in every case. If a site can be obtained where nature has provided the best part of the dams, well and good. The more generally necessary conditions are sloping banks, not too steep, firm soil or rock, and a gradual fall. As regards the first, it is to be presumed that the dam will be used for watering stock, and therefore it must be easy of access. The necessity for having a good foundation for the wall and apron and only a gradual fall does not need comment, and where unobtainable, it will probably be found cheaper to go in for some other method of conservation.

An effective and easily constructed timber dam, such as might be used for backing up water in creeks and lagoons, is shown in the accompanying cut.



TIMBER DAM.

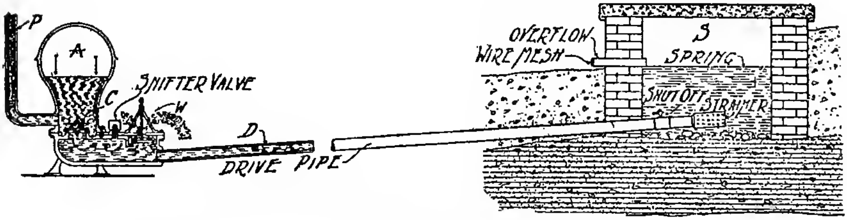
The interstices between the logs are filled with earth, and the face made watertight with sheeting of planks or clay. Of course such a construction as this would not stand the wear and tear of a continual current.

It may be remarked here that dams of every description require careful watching, especially when new. After a prolonged period of dry weather the earth is likely to shrink and crack. If the subsequent rise of water is rapid, there is a big risk of leaks occurring, which are almost certain to be disastrous to the work. In some cases it may be found necessary to protect the stone pitching on the down-stream side. Where the rush of water is great stones are liable to wash out, and a big hole rapidly forms. Covering the floor with wire netting is a good way to prevent this happening.

The Hydraulic Ram.

The principle and workings of the hydraulic ram are not very generally understood, and its use will in many instances prove of considerable value, particularly in the supply of water for domestic requirements. The following diagrams are taken from a bulletin on farm water supply, issued by the Ontario Department of Agriculture, Canada.

The hydraulic ram is a variety of pump in which the energy of the water falling from the source to the ram is used to pump a portion of the water from the ram to the buildings situated at a much greater height. Fig (*a*) shows a sectional diagram of the hydraulic ram. S is the source of supply, being a spring, pond, lake or river, D the drive pipe, W the waste valve which opens downward, A the air chamber, C the check valve between the air chamber and drive pipe which opens upward, and P the supply pipe by which the water is carried from the ram to the buildings.

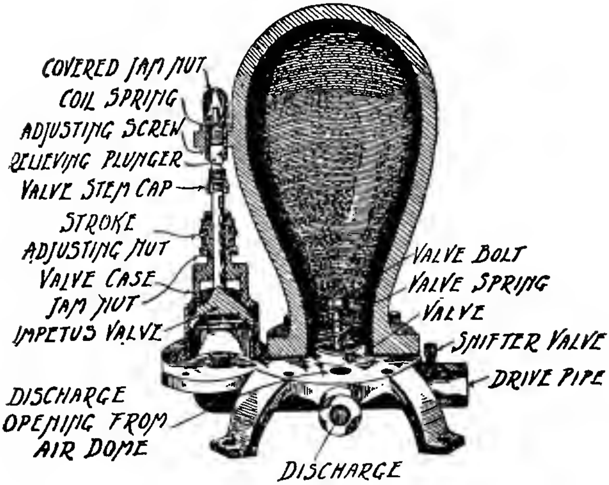


(*a*) Sectional Diagram of Hydraulic Ram Installation.

When the water flows down the drive pipe it finds the valve C closed and W open on account of their own weight, consequently it begins to escape through the open waste valve. As soon as the velocity of the water is great enough to counterbalance the weight of the valve W, the latter closes, and very suddenly, too. If the drive pipe D is 1½ in. in diameter and 50 ft. long, which is a length frequently used, the weight of water in the pipe is 38 lbs., and this is moving rapidly down the pipe. When the waste valve closes suddenly the 38 lbs. of water opens the valve C, and the water rushes suddenly and rapidly into the air-dome A. By-and-by, however, it comes to rest on account of the back pressure of the air. Immediately this happens the air begins to expand, and starts the water backward up the drive pipe. This lasts only an instant, just long enough for the check valve to close, but this small recoil is a very important factor in the working of the ram. When the check valve closes, the movement of the water backward in the pipe creates a suction on the waste valve, which, along with its own weight, opens the valve. Meantime, the air in A continues expanding, and drives the water at a steady rate up the supply pipe toward the buildings. While this is taking place the water is wasting through W, and as soon as the velocity is great enough W is closed again, and the whole cycle is repeated over and over again.

The air-dome is absolutely essential to the working of the ram. In the supply pipe leading away from the ram up to the buildings there is a large weight of water, and even the pressure from the 38 lbs. in the drive pipe couldn't set all that water in motion so suddenly. But in the dome is a cushion of air, and when the pressure comes that cushion is easily and quickly compressed, allowing a volume of water to rush in suddenly irrespective of the water in the supply pipe. However, since air is soluble in water the quantity in the dome gradually disappears, and when nearly all exhausted the ram will stop working, and the only way to start it again is to put fresh air into the dome. To do this it may be necessary to remove and empty it. Some drill a hole in it and put in an air valve similar to those used in bicycle or automobile tyres, and then by means of a hand pump force fresh air into the dome from time to time. However, it is possible to have air taken in automatically. It has already been pointed out that immediately after the valve C closes a suction is created in the drive pipe. If a small hole is drilled in it, preferably on the top side, and essentially close to the ram, then at each suction a few bubbles of air will be drawn in, and this will keep the air in the dome constantly replenished. During the pressure portion of the stroke some water will waste through this hole, and, consequently, in new rams a check valve is fitted into it to prevent loss of water, but admitting air. This is sometimes called a snifting, snifter, or sniff valve.

Fig. (*b*) gives a section view of a ram, by which it will be seen that the waste valve may be placed on the opposite side of the air-dome, in which case the drive pipe passes directly under the ram. As an additional help to open the valve W at the right time some rams are fitted with a relieving plunger operated by a spring. It is so situated that the stem of W hits the plunger when at the top of its stroke.



(*b*) Section of Hydraulic Ram, showing Parts.

Where conditions are suitable for a ram it is without question a cheap and satisfactory method of pumping water. It has one drawback—it wastes far more water than it pumps to the buildings, and hence can only be installed where the supply is from five to twenty times as great as required at the buildings.

Generally speaking, it is found that for each 10 ft. of lift there should be 1 ft. of head, but there is a limit—it is seldom advisable to install rams where the head is less than, say, 2 ft., although they have been known to work with as little as 18 in. The length of drive pipe should not be less than three-quarters the lift to the buildings, nor less than five times the fall from the spring to the ram. It may, however, be longer, but seldom exceeds 50 ft., and 75 ft. might be taken as an extreme length for sizes of ram suitable for farm conditions. If too long a drive pipe be used, the extra friction in it prevents the water from striking as heavily or as frequently as with a drive pipe just the right length.

Ring-barking and Timber Destruction.

The young sheep breeder, having tackled the problem of water supply for his stock, now has to consider the question of their feed, on which the timber on the property bears largely. If the land carries much, all trees, except those required for shade and shelter—and it is of first importance that good clumps should be left for these purposes—should be ring-barked, as the trees not only draw much of the nourishment from the ground that would otherwise go to support the grass, but, by keeping off the rays of the sun, cause the grass and herbage to be less nutritious. Fallen timber should be cleared off the land, as under the shade of logs many parasites find shelter that could not live without such shade, and reproduce their kind, tainting the pasture and spreading disease. Besides this, fallen timber takes up space, where good feed for stock would grow. Of course, it will be realised that ring-barking is not efficient with every class of timber, as, for example, indigenous New Zealand trees.

To sum up, it will be found that by draining where necessary, ring-barking superfluous living trees and clearing the ground of dead timber, the land may be made to carry a large number of stock better than it did a small number before. They grow to a greater size, fatten earlier and bring better prices. By care in draining, ringing and otherwise improving the land, it is easy to increase the returns.

There are numerous ways of destroying stumps, logs or standing trees, either by explosives, by burning, by the use of chemicals, and so on. In the first case the object of using explosives is to split and shatter the timber, so that a fire can be lit below it to burn it where it stands. This involves placing charges of the explosive in such a way that the soil around and below the butt of a standing tree or stump shall be loosened, so that the root system can be opened out without a great deal of labour, and a fire lit in the cavity. Trees and stumps treated in this way burn readily unless they are quite green, in which case they dry out rapidly and are soon ready for the fire.

Gelignite is probably the best kind of explosive to use, as it is easily handled, cheap and comparatively safe, although in any case, if the same care be taken in using explosives as in handling a gun, under average conditions there is practically no danger.

Some timbers, such as box, brigalow and belar are easily burnt, and explosives are not necessary, thus making the cost of clearing in such areas a small item. White gum, red gum, flooded gum, messmate, peppermint, mahogany, and other timbers are, however, hard to burn, and the cost of grubbing out stumps of same usually exceeds that of removal by explosives. Moreover, the latter method is much quicker, for whereas it would take a man a full day to grub a stump, gelignite has done it in half an hour.

In dealing with heavy timber, it will be found better to shatter and burn it, rather than attempt to blow it out. In Fig. 1 (which, together with Figs. 2 and 3, is from the " Farmer's Handbook") it will be seen that a charge is placed in the trunk, as well as under the tree. The explosion will split the trunk in many places and make a cavity under the tree, where a fire can be started. With piped, or hollow stumps and logs, it is best to put the charge in the hollow, and fill in with earth, rammed firm, and in the case of a hollow log lying on the ground, one end should be filled in and rammed tight first, while the charge is pushed in from the other end and also plugged securely. It is most important to remember that resistance is everything to the explosive; for instance, it is sheer waste of time and money to place a charge directly under a tree that has a "pipe" through it. In blowing out hollow stumps or trees, omit the charge directly under the tree, but place the charges as shown in Fig 2. The resistance is utilised in this case, with the desired effect.

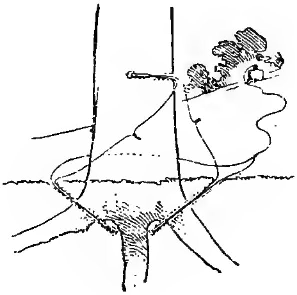


Fig. 1.

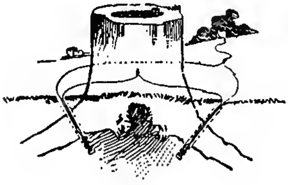


Fig. 2.

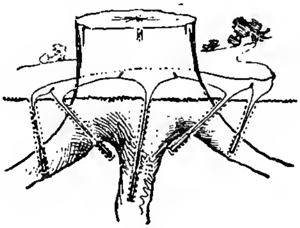


Fig. 3.

With a sound stump, having no tap-root, place the main charge directly under the stump, but with a tap-root, a good charge should be placed on both sides of it, and a small one into it, as in Fig. 3.

Many trees have large lateral roots, dipping away from the surface, and a small charge should be placed in these below the ploughing level (see Fig. 3). It is sometimes difficult to place charges in tap-roots that have not been uncovered, and good work can then be done by putting a smaller charge on each side of the tap-root; the effect of the explosion is then to cut that root as effectively as if the charge had been inserted in the middle of the wood.

Of course it must be understood that it is not meant that it is the best policy in all cases to go to the expense of blowing out every stump on the property. Ring-barking and felling, and the subsequent destruction by fire, aided in some instances by the use of explosives, of logs and other loose dead timber, is a valuable improvement to any sheep property. Naturally the cleaner it is the better, provided adequate shade and shelter for the stock is left, but to go to the expense of destroying every stump would in many cases be unnecessary, and would provide no adequate return, although it must be borne in mind that these stumps may easily provide harbour for rabbits. The man, however, who intends to go in for mixed farming, that is, to grow crops in conjunction with his sheep, will find it best to carry out to the full the method here outlined.

The depth at which the charges should be placed will vary with the character of the subsoil and the rooting system. Generally speaking they should be put down from 2 ft. 6 in. to 3 ft. 6 in. Experience will prove to be the best guide, but if there is a hard clay subsoil, or an equivalent, for the shot to "kick off" from, holes need not be so deep, whereas if the soil is sandy and of any considerable depth, the charges have to be deeper to secure the resistance.

It is advisable to keep the gelignite in a shady spot while working, and both the firing cable and the detonators should be tested with the galvanometer before using. Always pay out the cable towards the sun, so that when firing the back is to the sun, thus making it easy to keep an eye on flying timber. Another use of explosives may be mentioned before passing on to other methods of timber destruction, viz., the ridding cultivation paddocks of large boulders. Take a plug of gelignite, attach a No. 6 cap and about 3 ft. of tape fuse; place the charge on top of the boulder, and cover the charge with a "poultice" of moist clay. Make a nick in the end of the fuse and insert a small shaving of gelignite, touch this with a match and get well away. The boulder will be split in three or four pieces, and can then be thrown on a dray and dumped out of the paddock. Gelignite does not strike only upwards, but in every direction.

We now come to the use of chemicals for the destruction of green timber. Ordinary ringing is a slow process, but if poison is employed, probably a couple of years will be saved as well as large quantities of useful sound timber for fencing or firewood. Arsenic and soda can be used for this purpose, and to make the mixture, put a kerosene tin nearly full of water on the fire, add 2 lbs. of washing soda and 1 lb. of arsenic, and allow it to boil for an hour, stirring occasionally until everything is dissolved. Keep away from the fumes. Then fill up the tin with cold water, and use the mixture hot or cold, being careful not to let it under fingernails or into cuts, as it is a blood as well as a stomach poison. Ring-bark the timber with an over-lapping frill cut in the ordinary way, and pour the liquid in with an old teapot, wetting it all round—say, one-third of a cup for a large tree. Any small stuff is cut off with a straight or shaped cut as near to the ground as convenient, and the liquid is poured on to the stump very steadily. Wait a moment to let it soak in, then drip a little more on. The first application turns the sapling pink, and then a deadly dark colour. In a few days the tree should bear the appearance of having been rung for a month, and in three or four months it ought to be possible to let a contract for pulling down the dead timber. It should be mentioned, however, that this process is not entirely free from danger to stock. A landowner in New South Wales recently lost over 100 sheep in a peculiar manner. He killed some timber with the soda-arsenic mixture, and immediately after he had completed the operation, a wind storm brought down some boughs from the tree. The sheep in the paddock ate the leaves, and 108 died from the effects of the poison.

Saltpetre is another destroying agent. A hole is bored in the tree in a downward direction to the centre. For large trees, a 1-in. auger is used; for smaller ones, $\frac{1}{2}$-in. size is large enough. For large trees, one to two ounces is the quantity used, and for smaller ones half to one ounce. A plug is put in the hole to keep rain from washing it out. The nitrate of potash is carried by the sap to the tips of the branches, and to the rootlets. If the tree is a large one, say 2 ft. or more in diameter, very little difference will be noticed in the foliage for two or three months, then the leaves begin to fall and it assumes a bare, wintry appearance. At the end of about six or eight months you pile a little brushwood round the tree and light it, and there is no further trouble. It will smoulder away to the remote ends of the roots, sometimes 30 ft. from the butt of the tree, leaving masses of valuable ash in all directions. The same result would probably be achieved by pouring some kerosene into the hole bored for the saltpetre, and lighting it.

In letting contracts for ring-barking, be sure and find out the right time of year for the locality to commence this work. In some old ring-barked box country there is very often a heavy growth of suckers. These, if not grubbed out, will in time grow into a thick scrub, and greatly reduce the feeding value of the land. They must be grubbed out, tap root and all.

TIMBER PLANTING.

It may seem somewhat contradictory to advocate the planting of trees after outlining methods for their destruction, but it will be remembered that the foregoing advice has been qualified by reiterated assertions regarding the necessity for the preservation of adequate shelter belts and clumps for the stock. Now over very large areas of plain country in Australia bleak winter winds whistle unchecked by a single tree, and apart from the fact that this is very rough on young lambs or newly-shorn and possibly weak sheep, it is bad for the surface of the country, tons of soil and grass seed being blown away, piling up against and eventually obscuring and burying for ever wire fences and great tanks. But, as stated, it is at lambing time that the full benefit of plantations is felt on these plains. The percentage may be appreciably increased, the lambs grow bigger, and fewer poddies are seen in their midst. Of course, there are ways of providing shelter for stock other than by putting in mathematical looking plantations. One of these is planting a couple of trees to about every acre. In certain classes of country this can be done very cheaply by planting in the head of an old dead tree, and by the time the dead wood has rotted and crumbled away, the young tree is out of reach of the sheep. Opportunity should be taken to do this when the plantations are to be thinned out. Then the work will be proceeded with at a minimum of expense. If the trees were not thus planted out they would be wasted, and so not even the expense of buying seed is incurred.

Sugar gums have a great advantage over blue gums. They have leaves all the way down, and they drop no rubbish about the ground. Round blue gums there is a constant accumulation of dead leaves, bark and broken twigs. These are dangerous at bush fire time, for they are likely to set fire to the whole plantation.

Kurrajongs are pretty shady trees, and a great stand-by for stock in dry times. In their early growth they need protection from rabbits and stock, and this can be accomplished in certain country by putting a seed or seedling in the top of an old dead stump, five or six feet high. The decayed matter makes a fertile seed bed, and the tree will grow and flourish, secure from stock, till it bursts the stump asunder. A good way to germinate kurrajong seeds is to mix them with the dead leaves of the parent tree, along with wood ashes and soil from under the tree, and put them in a box with drainage so that they do not become over-moist. Keep them constantly wetted, not too wet. They require a good deal of heat, but not too much. The damp leaves and other decaying matter furnish this. They should be placed in the sun and covered by a few boughs in mid-day, so that the sun's rays do not have full play.

The following is a list of trees recommended for shelter belts and general planting in the inland districts of Australia :—

Sugar Gum (Eucalyptus corynocalyx).
White Cedar (Melia composita).
Aleppo Pine (Pinus halepensis).
Pepper Tree (Schinus molle).
Kurrajong (Sterculia diversifolia).
Sycamore or Plane Tree (Platanus orientalis).
Carob-bean (Ceratonia siliqua).
Mulga (Acacia aneura).
Gutch (Acacia catechu).
Myall, or Ironwood (Acacia stenophylla).
Cypress Pine, Mallee Pine (Callitris verrucosa).
White Pine (Callitris robusta).
False Acacia (Robinia pseudo acacia).
Honey Locust Tree (Gleditschia triacanthos).
Queensland Silky Oak (Grevillea robusta).
Tagasaste, or Tree Lucerne (Cytisus proliferus).

The last-named plant makes a good rough hedge. It is also a stand-by as a fodder plant in drought time, and will grow on very poor land.

CHAPTER III.

PERMANENT IMPROVEMENTS (*continued*).

FENCING.

General Notes on Fencing—Six-Wire Fences—Five-Wire Fence—Four-Wire or "Lightning" Fence—General Notes on Vermin-proof Fences—Three-wire and Netting Rabbit-proof Fences—Dog-proof Fences—Fences for Sheep Yards—Wire Splicing—Wire Strainer—Anti-corrosive Preparation for Netting.

The fencing of a holding requires a great deal of careful and judicious thought and planning in order to make the most of the land to be enclosed, and to arrange the paddocks in such a form that no feed is wasted. Before starting the actual work, the diagram of the property, showing all the watercourses, and the lay and character of the land generally, must be carefully studied, and the mind must be made up that the job is to be well done, for it is a saying full of truth that " bad fences make bad neighbours," and in addition they are always eyesores and a source of endless trouble and expense. Sheep soon learn to go through badly-gauged, poorly-strained and slovenly put-up fencing, causing loss and annoyance to the owner, as he cannot keep his ages and sexes properly apart, the paddocks get mixed up more or less, and he is never sure of the numbers in them.

The first thing to do is to call tenders for the erection of a boundary fence, or if all or portions already adjoin neighbours, then come to agreement with them as to the value of such fencing so as to pay half of such for using half or one side of the fence. If the fence is a rabbit netting, it is necessary to see that the netting is equally divided. This will be explained later on. Friendly arrangements should also be arrived at as to the locking of any boundary gates, and any repairs necessary. Ride along the fence carefully, testing the posts here and there, and get off and take special note of any flood gates as to their repair and efficiency, especially in rabbit and dog country. Of course, in purchasing a place, no payments to neighbours would be necessary, as the vendor had already done that when he entered into possession; but the purchaser would require to inspect the fence before buying, and ascertain its value. This is a very important item, because such fences belong to two parties, each of which has to halve the cost of repairs, and this often leads to arguments when both are not willing to effect such repairs.

There is no standard price for the work, and one must make the best terms he can. An expert station manager advises as follows :—"Let the work be done by contract ; the owner supplies the wire, and drops it along the fence. Get hold of a good man who owns a dray and horses, and he can then shift his own camp, and cart his wood and water, and an addition to the contract could be made by getting him to cut and draw the posts, and cart the wire out. This would relieve, for the time being, any newly-started selector of the expense of finding a team with dray and harness, also the expense of a driver, and would effect the saving of his own time if he had to drive it himself.

Be careful and see that subdivisional fences are erected where they can permanently remain, and not afterwards have to be pulled up because they will be in the road of future subdivisions ; if the land has been carefully gone over, and the plan system used, most of these mistakes can be avoided. Try and so arrange the paddocks that the various classes of country and water are fairly evenly distributed, avoiding congestion at the watering places. Look round and find out which is the most sheltered and sweetest of the country, and fence this in for the lambing paddocks. A good subdivision fence is made with the posts half a chain apart, with five wires and a top wire, one long dropper in the centre, and two short droppers on either side.

External boundaries do not require any planning, as they are already surveyed, but it is as well to see where the straining posts are going to come in, so that they can be utilised for the subdividing. A strain should never be less than five chains between each straining post, as the longer the strain the tighter the wires can be pulled. Short strains should be avoided when practicable, in order to economise posts, which are a serious item, and therefore a strainer should, wherever possible, be put in such a position that it will accommodate two lines of fencing, and be of sufficient strength to hold such a strain. A straining post out of the perpendicular is very unsightly, and also weakens the fence, and the old motto, "The chain is only as strong as its weakest link," is very apt in this case. The advice applies more to corners than anywhere else, because the tendency is always to pull out of perpendicular in more than one direction.

In forecasting the position of the fences, it is also very necessary to have the tanks in the right positions, so that one tank will water as many paddocks as possible. The proposed fencing lines and tank positions should all be set out roughly to scale on a plan, so that these improvements need not all be done at the one time, but can be worked on as opportunity and money permit.

A boundary fence should be substantial, and, taking Australia generally, rabbit-proof. With the great increase of the pest of late years, the extra cost of a wire-netting boundary fence is almost invariably capital well invested, and is very often an urgent necessity. Against the extra cost of netting must be put the saving in the cost of rabbit destruction, which will naturally be less if the pest is kept off the run. Inside a good netting fence, every rabbit killed, every warren dug out, and all cover destroyed are steps towards extermination, while if the station boundaries are unprotected from the teeming thousands all efforts at destruction are little more effective than attempts to bale out the ocean.

Of great importance is the selection of timber for posts. Some timbers last almost for ever, while others go " between wind and water" in perhaps four or five years. Some excellent Australian fencing timbers are ironbark, yarran, pine, box, myall and red gum, and in New Zealand puriri, totara and henau are most lasting. Again, there are varieties of timber which, while making most durable rails, will not last any time in the ground.

In ordinary country, posts for a wire fence should be 20 to 24 inches in the ground, a one-rail and wire fence 24 to 27 inches, and a two or three rail fence 24 to 30 inches, the soil determining the actual depth. It is false economy to have the posts too light, but at the same time it is possible to have them too heavy. A fair average to work on is 6 x 3 in. with hardwood, and 8 x 4 in. with pine. When droppers are not used, posts are generally placed from 9 to 10 ft. apart, except with netting fences, where the distance is usually 16 ft. With droppers the panels can be extended up to over 60 ft. A space of 40 ft. with three droppers makes a reasonably safe fence. On big holdings, where cheap lines are required, so-called lightning fences, comprising four wires, with posts up to 80 ft. apart, can be erected. Cheap fencing, however, is usually dear in the long run.

Straining posts should be sunk 3 ft. to 3 ft. 6 in. in the ground, and be at intervals of from 100 to 150 yards, according to the weight of fence. Struts should be of hardwood, at least 9 ft. long, and sufficiently stout. They should be mortised into the straining post, 5 to 10 inches from the top, and rested against the base of the next post (underground), or against a block of timber buried in a trench cut at right angles to the line. It is essential not to have the strut too short, or to place it at too sharp an angle with the straining post, as otherwise when straining up the post it will be lifted out of the ground.

Fences at corners and adjacent to gates require to be specially strengthened. The best way to do this is to put in extra posts (with top rail) every 5 ft. or so, for 10 to 15 yards. If timber is scarce use droppers. Also at corners put in two strainers, one to take each line of fencing. Gates should not be hung from straining posts, and gate posts must be independent of the fence.

With wire fences some men thread the wires through auger holes in the posts, while others believe in stapling the wire to the post, on the ground that stapled posts stand grass fires better than those which have been bored, but against this there is the risk of staples rusting or drawing out after a time. Care must be exercised in boring posts, otherwise it will be found very hard to draw the wires through. The holes and wires must be parallel. For Nos. 6 and 7 wire a $\frac{3}{4}$-in. auger is large enough, while for Nos. 8, 9 and 10 wire a $\frac{5}{8}$-in. auger is generally used. No. 8 wire is suitable for general purposes. Heavier wire is difficult to handle, and there are lighter wires of greater strength now upon the market. The fence line should be well prepared, and all timber likely to fall on a fence should be cut down.

Of recent years metal and wooden droppers have come much into vogue in connection with wire fences. As they do away with the necessity for, say, three posts in every four they effect a considerable saving, besides reducing the possible damage from grass fires. Apart from wooden droppers, there are several kinds of iron and steel droppers on the market. There are also good iron standards manufactured, so it is quite possible to erect a perfectly fire-proof fence.

No hard and fast rules can be laid down as to what a really good fence should cost, because so much depends on the nature of the country, the proximity of good fencing timber, and the distance of carriage, &c. But the "penny wise and pound foolish" practice cannot produce more logical results than in this matter of fencing.

You can lessen the cost of a fence in many ways. For instance, you can get light intermediate posts, light strainers, short posts, which cannot be so deeply sunk; you can have few intermediate posts, and you can also reduce the initial cost by using the first timber at hand, irrespective of its lasting characteristics, and by buying cheap wire and material, and employing inexperienced labour to erect it. But by thus keeping down the initial cost of a permanent fence, one is courting a store of trouble and expense which will last till the job has ultimately been properly done.

SUBDIVISION.

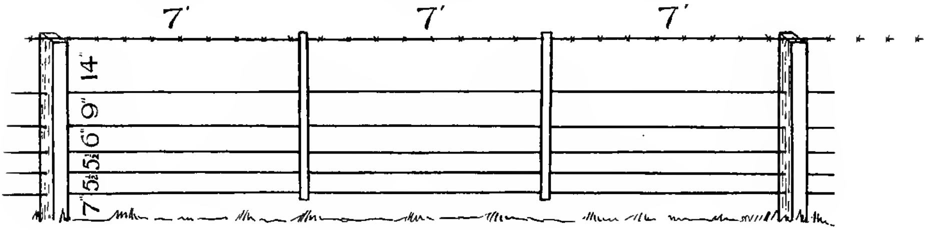
With regard to subdivision, it may be stated that the hazardous way this is done very often leads to a waste of money that would go a long way towards putting up other essential improvements. It should be worked out according to plan, for without a knowledge of the areas of the portions enclosed, it is impossible to stock properly. The woolshed, yards and stock-working appliances should all be set out before any actual work is put in hand in relation to the fence lines. Everything should be done to save labour that can be avoided, with the consequent expenditure of less money. The woolshed or yards, or in fact any place where stock congregate, should never be placed on the catchment of a tank, or in any position where the droppings are liable to get into it, so that the location of these buildings should be fixed upon after the tank site has been pegged out, and all subdivision fence lines plotted on the plan. In fact, the whole holding should be improved on paper first, and rigorously criticised, so that when the actual work starts there will be nothing to undo.

Small holdings are not so difficult to subdivide so long as the formation of the land gives a tank site fairly central, making it possible for one excavation to serve more than one subdivision, and building the fence lines accordingly. When subdividing for mixed farming, it should never be lost sight of that the fences must be so arranged that there is little driving to do, especially to water. No stock thrive as well when driven as when they are left to their own sweet will. Many farmers subdivide anyhow, and when the crop is taken off, if they are fortunate enough to own sheep, they have to leave the gate open or draw some of the wires to enable the stock to water, which is all very bad for the fence and bad for the animals. These small items, if thought over beforehand, will in many instances save enough money to put up considerable lengths of fencing. Splicing the wire should also be studied, because some splices are very wasteful and not at all neat, one often seeing a splice a foot long, whereas three to four inches is ample. Of course land differs so much in conformation that in some cases it is more difficult to subdivide economically than in others, but a lot can be done by devoting a little careful thought to the problem before actually setting to work.

On all stations, a large number of small paddocks close to the homestead are found to be of the greatest advantage. The greater the number of these enclosures encircling the homestead the more convenient and easy to manage the run proves itself. One small division may be useful for running killing sheep, another for some special mares and foals, a third for feeding up a few show sheep, and so on. But for the sake of convenience, indeed, to render them of any real advantage, it is necessary for these small paddocks to be close against the homestead. To have a great number of such enclosures within easy range of the home buildings requires no small ingenuity of construction, and when not carefully laid out at first in many cases proves impossible. The principal point to be aimed at, when planning, is to utilise all the land within a certain radius, and for each small paddock to have a part running up to and joining the home enclosure. If this be arrived at, feed, or if necessary water, can be carried to each division with practically no cartage. Now the most complete method of achieving this ideal of homestead subdivision is as follows :—Let a fence be put up enclosing a circle, say a mile and a-half in diameter, and having the homestead for a centre. This circle contains 880 acres, and let us put the homestead, garden, &c., down at 20 acres, which leaves 860 acres for subdivision into small paddocks. From the homestead erect the necessary number of fences forming radii to the circle. There will be the same number of paddocks as the circle has radii. If there be ten then the 860 acres will be divided into ten paddocks, each containing 86 acres, though of course some could be made larger than others. In the majority of cases it will be found more convenient to do so. In this manner there will be a large number of divisions, each with the wished-for area, and each with a gate opening into the home enclosure. The advantages of such subdivisions are not easily over-estimated, and will handsomely repay the cost of fencing.

Six-wire Fence.

Coming to actual specifications, we will deal first with open fences, that is to say, not vermin-proofed. A seven-wire fence, owing to the heavy cost, is seldom used, and need not be dealt with here. The following, however, makes a strong fence suitable for all general purposes, and one which is commonly used in Australia. The fence should be lowered slightly if it is intended to be used where crossbreds are grazed. The total height, as depicted, is 3 ft. 11 in. The gauge is :—From ground to bottom wire, 7 in. ; from bottom wire to second wire, 5½ in. ; from second to third wire, 5½ in. ; from third to fourth wire, 6 in. ;



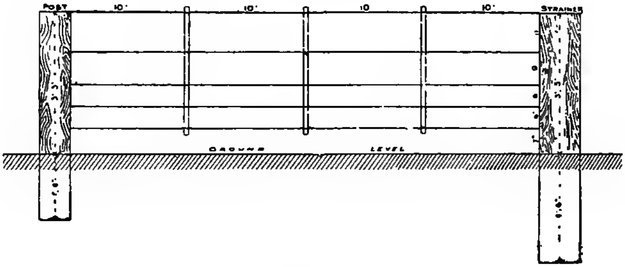
Six-wire Fence.

from fourth to fifth wire, 9 in.; and from fifth to sixth wire, 14 in. Posts 8 x 4 in., or 6 x 3 in., according to the timber, 6 ft. long, 2 ft. in the ground, and placed 21 ft. apart, with two droppers in every panel 7 ft. apart, strainers every 119 yards.

If one requires a still lower six-wire fence (3 ft. 7 in.) the following gauge may be used :—From ground to bottom wire 5 in.; from bottom to second wire, 5½ in.; from second to third wire, 5½ in.; from third to fourth wire, 7 in.; from fourth to fifth wire, 9 in.; and from fifth to sixth wire, 11 in. Top wire may be barbed or plain as necessary.

FIVE-WIRE FENCE.

The accompanying plan shows a good five-wire fence that is suitable for farming districts, and is comparatively cheap to erect. It is 3 ft. 3 in. high. The posts must be strong, 4 ft. 9 in. long, buried 18 in. in the ground, and placed at intervals of 40 ft.



FIVE-WIRE FENCE.

Strainers, 5 ft. 9 in. long, 2 ft. 6 in. in ground, are erected every ten panels (133⅓ yards). Three droppers are used in each panel.

The gauge is :—Ground to first wire, 7 in.; from first to second wire, 6 in.; from second to third wire, 6 in.; from third to fourth wire, 9 in.; from fourth to top wire, 11 in. The top wire may be barbed or plain as desired. With a fence of this description it is absolutely necessary to use a special wire. No. 10 or No. 12 is recommended.

It is thought by some practical men that the gauge of this could be improved by having the space between the first and second, and second and third wires reduced to 5½ in. in each case. The gauge would then be :—Ground to first wire, 7 in.; from first to second wire, 5½ in.; from second to third wire, 5½ in.;

from third to fourth wire, 8 in.; from fourth to fifth wire, 13 in.; It will be noticed that the distances between the third, fourth, and fifth wires have also been altered slightly.

Four-wire or "Lightning" Fence.

A special four-wire sheep fence may also be given here. It is known as the "lightning fence," has the advantage of being cheap and easily erected, and is very useful for subdivision. It has already been referred to, but fuller particulars are:—Posts 4 ft. 5 in. long, and placed 18 in. in the ground; not less than 5 in. through at the smaller end, and should be well rammed, 50 to 90 ft. apart, according to country passed through. The strainers are 5 ft. 5 in. long, not less than 7 in. through at the smaller end, and are embedded 2 ft. 6 in. in the ground, 135 yards apart. Droppers are necessary every 25 to 30 ft., and if the distance between posts is great they must not be so heavy as to cause the wires to sag. The gauge, where Merinos are run, is as follows:—Ground to first wire, 9½ in., first to second wire, 7½ in.; second to third wire, 6½ in.; third to top wire, 9½ in.; top wire being 2 in. below the crown of the posts. The total height of the fence is thus only 2 ft. 9 in., but it can, of course, be made higher if so desired, by the addition of an extra wire. It is necessary to use No. 10 or No. 12 gauge. The droppers should be 2 ft. 2 in. long, which allows for 1½ in. above the top and below the bottom wires, a ½-in. hole being used. Gidgie and Red Mulga will be found very suitable timber for these droppers.

Rail fences are seldom used except for small paddocks and yards, and as common sense and special circumstances will dictate their construction, they need not be dealt with here.

Vermin-proof Fencing.

We now come to the very important matter of vermin-proof fencing. In Australia where rabbits and wild dogs are two of the greatest curses that the sheep-man has to contend against, wire netting fences in the districts infested by either of these pests are a *sine qua non.* There is naturally a good deal of difference of opinion regarding the height and other specifications of vermin-proof fencing, but there are some general hints on the erection of netting that may be pretty safely followed by the novice.

First of all, it is absolutely necessary that the job should be done thoroughly and completely, for once put up it must remain as it is, and if badly erected it gets out of repair very quickly. The quality of the netting used should be of the best, and the general opinion is that the most suitable for use on boundary fences in districts where rabbits abound is 17-gauge, 1¼-in. mesh, 36 or 42 in. high. A lighter netting, say, 18 x 1½ x 36, will do for subdivisional fences, and where cattle are run the fence should be barbed.

As it is a difficult and tedious job to repair wire netting after a tree has fallen across the fence, the line should be cleared if it can possibly be managed. In lightly timbered country the timber should be removed completely for one chain, and if in heavily timbered country, where the cost of complete clearing would be prohibitive, the unsound and leaning trees could be taken down. If a chain strip can be cleared, it forms an effective fire break, and so ensures against fire both the fence and the netting, as stock invariably keep a track of clean ground along a fence clear of grass, both by feeding and constant traffic. Fire, even a grass fire, spoils the temper of both wire and netting, even if it does not actually destroy a fence, and when burning a break along netting the flame should be kept away from the fence, either by a plough furrow or by burning when the wind is blowing from the fence.

With netting it is not necessary to have the posts so close together as it is with ordinary wire fences. Posts 16 ft. apart will make a strong enough fence for all ordinary requirements. Split posts should be put up with the flat side facing the netting, and the true line taken along those flat sides, not the centre of the posts. If the holes to take the wire are bored about 2 in. from the inner side, instead of the middle of the posts, it will give the work a much neater appearance.

After the posts and wires have been erected the trench to take the lower selvedge of the netting has to be cut. This should be so done that it will have a perpendicular face running along the line, and flush with the flat side of the posts. A straight 5-in. mattock or a spade are the best instruments for making the trench. Ploughing may be quicker, but it is not so neat or satisfactory. The trench should be 7 in. deep to allow the netting to be buried at a uniform depth of 6 in. To get it to set properly the netting must be fastened to the posts in a straight line, any small inequalities in the level of the land being protected by attaching extra strips to the bottom of the main roll. On sand hills it is a good plan to use netting 6 in. or 1 ft. wider than elsewhere, and to bury it 12 in. to 18 in. in the ground. In mountainous and rocky country, where trenching is impracticable, the netting may be turned at right angles at bottom for 6 in. and secured by means of stones.

When the trench is prepared a coil is unrolled beside the line. It will be found to be slightly concave, or with a long and a short side, as it is called. It is the long side which goes into the trench. To get out the kinks, &c., let two men go along the strip with bale hooks and straighten it out where bellied or narrow. One end of netting is then fastened securely to the straining post, and about a third of it raised and put against the fence, which length is generally quite as much as can be strained at one time. The straining can be done from the nearest post. The simplest method is to lace an iron bar the full width of the netting through the meshes. The bar is then connected with an ordinary strainer by means of three short ropes or chains and hooks on a ring, to which is attached a few feet of fencing wire. The strain must be applied steadily and slowly. When taut the top selvedge can be stapled to the posts and the tying completed, care being taken to keep the netting pushed down to its full width, and at the same time not to pull the meshes out of shape. Ties to be from 30 to 50 in. apart. When making the last strain of a roll the bar should be laced through about 10 or 12 ft. from the end. Doing this makes it much easier to splice on a new roll. Each coil of netting should lap over the following by 6 in. to make a secure join, and laced with tie wire up one side and down the other.

If the fence is being erected by unreliable men it is advisable to stipulate that the trench shall be left open for inspection after the netting has been fixed. Unless watched, employees may lessen the depth of trench arranged for and lay the netting flat instead of perpendicular.

It is sometimes found that staples work loose after a few years. A good plan is to use 2 in. nails instead. Drive them in about 1¼ in. and bend over a piece of iron. Care must be taken to see that staples or nails do not jamb the netting, because if they do the netting will quickly rust away. For ties use No. 16 galvanised tie wire, and have it passed twice round the top selvedge when tying. Often neither staples nor nails are used, the netting being tied to the fencing wires only. This makes a quite satisfactory job. No struts should be allowed to remain unprotected on the side of the fence from which vermin are likely to come.

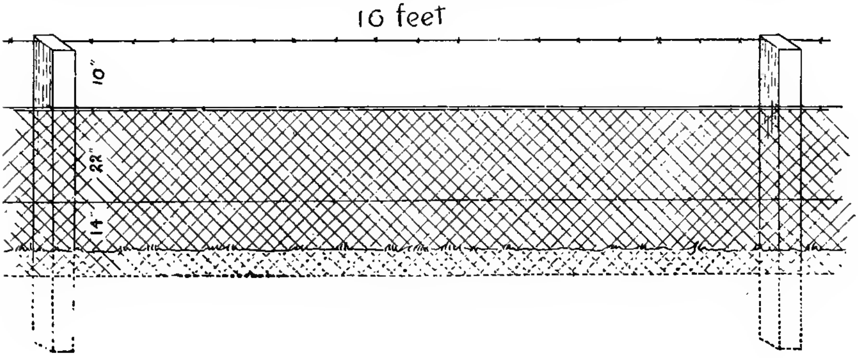
A newly-erected netting fence ought to be inspected almost every day for a time. Rabbits love to grub in the fresh-turned soil along the trench, and unless watched will work right under.

On at least half the length of fence the netting should be on the outside; if Crown land adjoins, put it all on the outside. A neighbour will claim half of it to be put on the opposite side from him. The reason is this. The rabbits climb up the netting with the aid of the post and get over, hence keep all the posts possible on your own side. When the netting is halved, the best way is to take strain and strain in turn.

On land liable to floods, it is advisable to lay the netting on to the posts and not tie at all. If this is done the keys can be pulled out when a flood threatens, and the pressure of water will soon lay the netting flat. Of course the wire must be placed on the down-stream side of the posts, and should be fastened to the straining posts on a batten. Always use galvanised wire for supports and ties, black wire is sure to rust.

THREE-WIRE AND NETTING FENCE.

Coming to specific types of rabbit-proof fence, perhaps the most suitable for an ordinary sheep run is the three-wire and netting. It is largely used throughout Australia, both for boundary and subdivisional lines, and is comparatively cheap and strong. At corners and gates it is advisable to strengthen the line by putting in two or three extra posts 5 ft. apart (with top rail), or a couple of droppers in each panel. The height is 3 ft. 10 in.



RABBIT-PROOF FENCE.

Posts, 6 in. x 3 in. or 8 in. x 4 in., according to timber used, 5 ft. 10 in. long, and sunk 2 ft. in the ground at intervals of 16 ft. Strainers should be round posts 7 or 8 in. in diameter, 6 ft. 10 in. long, put 3 ft. in soil, and placed every 80 yards. Netting, 42 x 1¼ x 17, should be 6 in. in trench and tied to first and second wires.

The gauge for the wire is :—Ground to first wire, 14 in. ; first to second wire, 22 in. ; second to top wire, 10 in. Top wire may be barbed or plain as desired, although barb is to be preferred with this class of fence.

Should it be decided to use 36-in. netting the gauge would be :—Ground to first wire, 12 in. ; first to second wire, 18 in. ; second to top wire, 14 in. This gives a fence only 3 ft. 8 in. high, so the posts may be cut 2 in. shorter than mentioned above.

The following complete specification for a rabbit-proof netting fence, three wires, is one used by a large pastoral company controlling a number of properties throughout Australia :—

Strainers.—A straining post 7 ft. in length, not less than 9 in. in diameter, shall be erected every 100 yards, sunk 3 ft. in the ground, and well rammed.

Posts.—The posts shall be 5 ft. 8 in. in length, not less than 8 in. by 4 in. (8 x 4), shall be sunk 20 in. in the ground at a distance apart of 16 ft. from centre to centre, and shall be well and firmly rammed.

Angles.—All angles shall be stayed with an extra post 7 ft. in length put in the ground 3 ft., such post to be not less than 9 in. in diameter, and placed in the centre of the angle 7 ft. from the strainer, and a rail not less than 4 in. in diameter shall be mortised into the extra and corner post, the mortise holes to be 8 in. from top of the post.

Timber.—All timber used shall be sound and free from pipe ; measurements will be taken from small end, and all posts and strainers should be put into the ground large end down.

Boring.—Boring of all posts and strainers shall be done with a ⅝-in. auger as follows :—For the bottom wire a hole 14 in. from the ground, and for the second wire a hole 37 in. from the ground, and for the top wire a hole 46 in. from the ground. All holes to be bored close to the edge of the posts, on side on which netting is to be hung.

Wire.—Wires to be threaded through the posts, tightly strained, and neatly and securely keyed.

Netting.—The netting shall be put on the fence perfectly upright, with the proper edge in the ground, care to be taken not to break or misshape the mesh, each length of netting to be lapped over the next one 6 in., and to be laced up one side and down the other, so as to make a secure join. The netting to be tied on to the strained fence with ten ties to each panel, the ties to be made with 16-gauge wire, and to be taken twice round the netting and strained wire in 1-in. loops or rings, and the ends twisted closely together. The ten ties to be made as follows :—Six ties to the wire along the top edge of the netting at equal distances apart, and four ties to the bottom wire at equal distances apart. The netting shall be put 6 in. in the ground, and in the event of holes or uneven ground the netting to be carried on straight, without bulging, and separate pieces attached where necessary, so that the netting is sunk continuously 6 in. in the ground. The netting to be placed on the low side of the fence.

Trench.—A trench shall be sunk 7 in. in the ground in line with the fence posts, and not ploughed. The netting shall be placed upright therein, and the trench shall be then filled in with earth above the original surface of the ground.

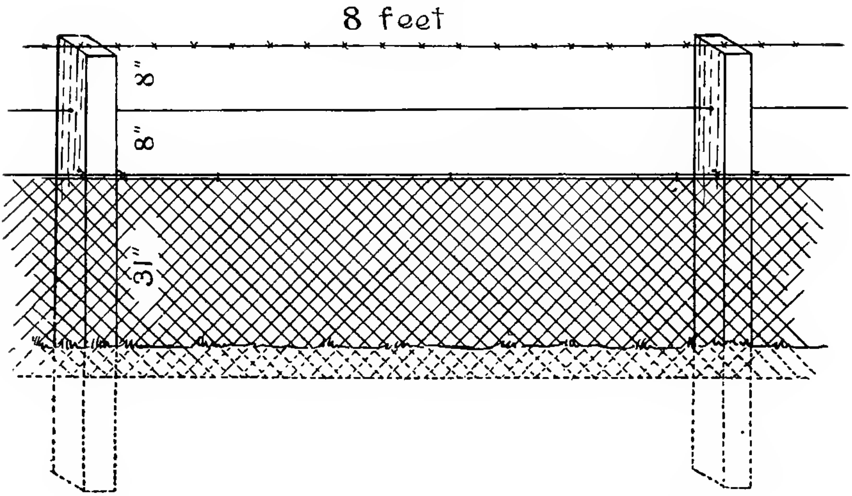
Clearing.—A space shall be cleared of all timber 20 ft., 10 ft. on each side of the fence. All standing timber and bushes to be cut level with the ground, all logs to be removed from the line of clearing, and all overhanging trees liable to fall on the fence to be lopped or cut down to suit the case.

Flood gates.—All flood gates required on the fence shall be made as follows :—One cable of 3 or 4 No. 8 gauge galvanised wires closely twisted together shall be stretched across the watercourse, and attached to posts or trees on either bank, such posts (if no trees) to be 8 ft. in length and 12 in. in diameter at the small end, and sunk 4 ft. in the ground and securely stayed. This cable to be placed on the bed of the watercourse, and stretched taut. A single wire shall be stretched across the watercourse as above parallel with the cable for holding the gates. A piece of netting 12 in. in width shall be sunk into the bed of the watercourse, and attached to the bottom cable, such netting to be packed with stone on each side 12 in. deep and 6 in. wide. Gates made with No. 8-gauge galvanised wire and wire netting as follows :—An oblong frame 9 or more ft. in length and 42 in. in depth made of three strands of wire twisted closely together and stayed with four stays made of two strands of wire twisted closely together, the ends to be joined by keying neatly and securely. This will form the frame of the gate. Over the frame wire netting is to be stretched and securely fastened, such netting to protrude at the end of each gate at least 6 in. Gates, when completed, are to be hung between the two cables across the river, securely fastened to the bottom cable, and lightly fastened by hooks to the top.

Note.—The distances between posts and strainers are for new fencing only. Any posts replaced in an old fence should be put in the same place from which the old ones were removed.

Another strong rabbit-proof fence, 3 ft. 11 in. high, with only three wires besides the netting, can be erected on the following gauge, provided timber is plentiful. Having the posts only 8 ft. apart, the wire along the centre of the netting is left out.

Posts 6 x 3 or 8 x 4 in., 6 ft. long and sunk 2 ft. in the ground at intervals of 8 ft. Strainers should be round posts 8 or 9 in. in diameter, 7 ft. long and 36 in. in the soil, and placed every 80 yards. Netting 36 x $1\frac{1}{4}$ x 17, with 5 inches in the trench tied to the first wire 31 in. off the ground. Second wire is 8 in. above first wire, and top wire 8 in. above second wire. This class of fence is particularly suitable for enclosing farms or comparatively small blocks. The top wire should in any case be barbed. All wires and netting may be stapled to the posts, on the outside for preference.

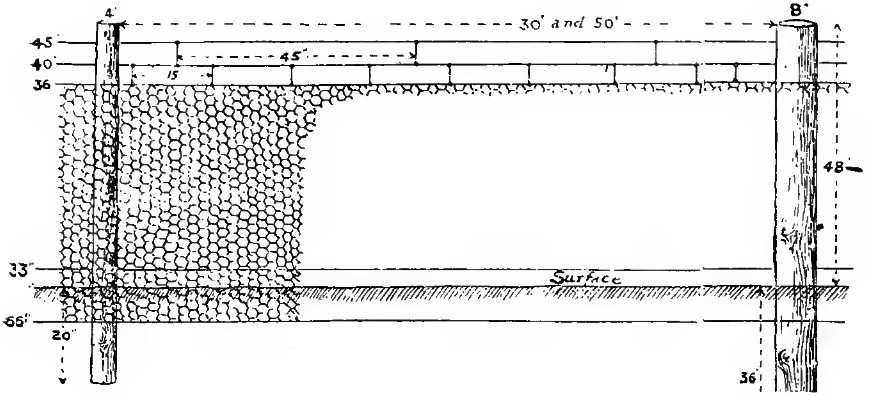


Another Three-wire and Netting Rabbit-proof Fence.

Dog-proof Fence.

Dealing next with wild dogs, which are unfortunately a seriously increasing pest in many parts of Australia, there is again a marked difference of opinion, particularly in regard to the height of the fence. Personally we believe that 3 ft. 9 in., which many men regard as too low, can be made a thoroughly effective height, but it must be borne in mind that the fencing is, after all, only a means to an end, not an end in itself, the end being the killing of the dogs, and a 3-ft. 9-in. fence, properly looked after and supported with poison baits and traps, should satisfactorily enable this end to be achieved. Of course, no fence is really "dog proof," for although the term may be justly used to-day, heavy rain may fall to-night, and to-morrow there are numerous openings through which dogs can get before it is possible to have them effectively closed.

This will be the case whether the fence is 3 ft. 9 in. or 5 ft. 6 in., but as already stated, an effective system of trapping and poisoning would very soon cope with these stray interlopers. The natural instinct of a dingo is to get under or through a fence. Jumping is an acquired art, and although many practical men probably will not agree with this opinion, it may be said that a 3 ft. 9 in. fence, kept under constant supervision, will prove an effective dog barrier. The following is a sketch, with specifications, of the fence in question :—



THREE-WIRE FENCE, ALL PLAIN.

Guard wire at 3-in. above ground, rendered necessary owing to loose, sandy nature of soil. Netting (42 in. x 1½ in. x 18 G.) hung to plain wire at 40 in., no wire at selvedge, and no body wires.

It must be borne in mind that the risks of damage to a vermin-proof fence are very much greater than in the case of an ordinary wire fence; hence the more simple its construction, within reasonable limits, the easier and cheaper it will be to maintain in good order or to repair if washed down. The wire along the netting three inches above the ground will prevent dogs pulling up the netting in light sandy country, and coming in and going out under it. Doubtless after every good rainfall there will be numerous evidences of dogs getting through the washaways before they can be repaired, but if poison baits are continually laid both inside and outside the fences, and plenty of dog traps kept continuously set, the inroads can easily be coped with.

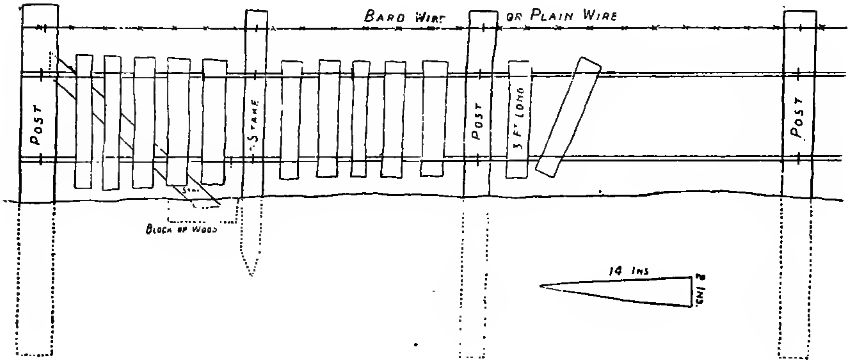
We will now take the experience of Mr. H. S. Officer, of Kallara Station, Western New South Wales, who is an advocate of the higher type of fence. He says :—" We erected a fence 5 ft. 3 in. high of rabbit netting (3 ft.) and marsupial netting (2 ft. 3 in.) on top. So far this fence has proved during its two years' existence a complete barrier, and no dog has yet crossed it. So far as flood damage is concerned, we have experienced none that could not be repaired in a few minutes by the man we keep in charge of the fence, notwithstanding that the country traversed by the fence is rough and hilly, with many creeks and gullies. Our plan is to erect 'swing flood gates' across all such danger spots, *i.e.*, strain a cable of twisted fencing wire across the creek or gully either from tree to tree on opposite banks, or if no tree is available, firmly erect a strong, high post on top of each bank, and suspend about 7 ft. of netting from the cable, leaving a lap of about 18 in. of netting lying flat on the ground forming the bed and sides of the creek, and weight this down with light timber or stones merely laid on it, so that running water will easily lift the netting, which falls back into position again when the water subsides, and is quickly readjusted by the caretaker when he comes round. The big lap on the surface seems to be just as effective in stopping dogs as if the netting were buried, which, of course, would be fatal in a creek." Mr. Officer holds that from practical experience the 3 ft. 9 in. fence is not " dog-proof" in his district, but as already stated, a great deal depends on the definition of the term " dog-proof." It may not actually keep every dog out, but if properly looked after and supported with poison and traps, it should serve the same purpose.

The following are specifications of a dog and coyote proof fence designed and used by the United States Department of Agriculture :—Posts, 7½ ft. in length, set 2½ ft. in the ground and 16 ft. apart ; a barbed wire stretched flat to the surface of the ground ; 3 inches higher a 36-in. woven-wire fence having a 4-in. triangular mesh ; 5 inches higher a barbed wire ; 6 inches higher a second barbed wire : 7 inches above this a third barbed wire. Total height, 57 inches. It is essential that the bottom barbed wire be stretched flat on the surface of the ground at all points. This is accomplished by grading the ground before the fence is built and by filling in the small holes afterwards.

Fences for Sheep Yards.

The question of good durable fences for sheep yards is an important one, and the following will be found to make a very strong fence that will stand any amount of hard wear. The height of the top rail is 3 ft. 11 in. Posts to be 6 ft. long, 2 ft. in the ground, and at least 8 x 4 in. if of split pine, 6 x 3 in. for box and ironbark. Rails may be of round timber, 3 to 5 in. in diameter at small end, 12 ft. long, and scarfed to posts (on the inside). The gauge to the centre of each rail is :—Ground to centre of first rail, 7 in. ; from first to second rail 5½ in. ; from second to third rail, 5½ in. ; from third to fourth rail, 6 in. ; from fourth to fifth rail, 9 in. ; from fifth to sixth rail, 14 in. The same gauge could be adopted should it be decided to use wires instead of rails, although this is not recommended.

A cheap fence such as is suitable for putting round small sheep yards or any small enclosure, is depicted here. It will be noticed that the wires are woven in between the palings. The posts can be placed from 10 to 12 ft. apart, but it is advisable to drive a stoutish stake between each to strengthen the panels. The method of erection is to first put up the four wires, and then slip the palings in between, the pointed instrument shown in the drawing being used to open the wires and knock the palings in place. It will be found necessary to slacken the wires occasionally during this operation, so they should not be made fast until all the palings are in place, although they must be kept taut. Let a turn be taken round the end post, and the wires played out as required, or better still, fasten a large block of wood to the ends for an anchor and let that be dragged along the ground as the palings are worked in. No. 8 wire is about the best to use.



Wire and Paling Fence.

Wire Splicing.

A knowledge of wire splicing is very necessary in fencing, and it is a thing that should always be carefully and properly done. The following are five of the more common and useful splices :—

Fig. 1 represents the knot splice now almost universally used. It is far better adapted to wire that is not pliable, and somewhat brittle, than any other. It is also easiest to make. Fig. 6 is an alternative to this, and may be found even better.

Fig. 2 also represents a knot splice, but not so good as Fig. 1.

Fig. 3 is the loop and twist splice, often used, but not so good as the first.

Fig. 4.—The loop splice. This splice is objected to principally on account of its liability to break under sudden pressure, and the fact of one wire being liable to cut the other.

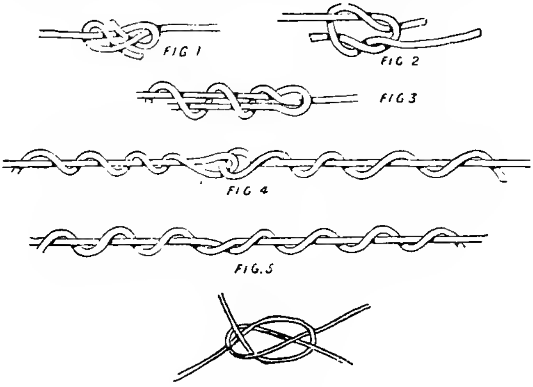
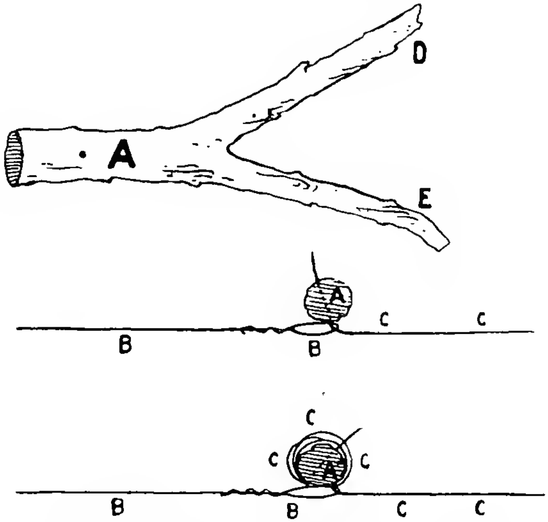


FIG. 6.

Wire Splices.

Fig. 5.—The telegraph splice. This is the oldest of all splices, and one that can only be recommended where new wire is used, as the short turns necessary to make it generally cause the wire to break, sometimes when one half the splice has been completed.

Few things are more useful than a simple contrivance for straining up wires which have broken in an old fence. It is the usual practice to mend the break, and leave the fence at that. This will, of course, allow sheep to fall through the fence whenever they may fall or press against it. Most strainers are made to tighten up the wire at the post, and are far too cumbersome to carry about. The method illustrated will strain between the posts wherever the break occurs. It may also be used at the straining post, and at either it is as rapid a plan as any. Its chief merit lies in its simplicity, and the ease with which it may be carried. It will ride of itself on the wither of one's horse ; but, as one can be made in less than a minute, they can be left about the run, say at the gates of the paddocks. All that is necessary is an ordinary forked stick with a hole large enough to pass a wire through at A. If the break occur in a part of the wire away from the straining post, as it almost always does, one end of the wire, which we will call B, is bent back, and an eye made in it as in the figure. Then the other end of the wire (C) is passed through the eye or loop in B, then it is pushed through the hole A in the butt of the forked stick. After this has been done the forked stick is turned round and round by prongs D and E. These latter give great leverage, and it will be found that the wire is soon strained to sufficient tightness. When the fork has been revolved the required number of times, it is quickly moved on to wire C, so that this wire is doubled back on itself. The angle thus formed will be found to hold both together until C is fastened. Care should be taken to avoid making a twist in wire B, for if C does not run smoothly through the eye in B, considerably more force will be necessary. A fresh bit of wire has generally to be added to C to



SIMPLE AND EASILY PORTABLE WIRE STRAINER.

allow of its being brought up to B in the first case, and the joining should be put so far back as to avoid catching in the eye in B when straining.

Wires often break when straining during cold frosty weather, and it is advisable to carry a tin of hot coals to warm the wire before commencing operations. An oil drum such as used by the tinsmiths will answer the purpose admirably and save a great deal of unnecessary labour and loss of time.

ANTI-CORROSIVE PREPARATION FOR NETTING.

In concluding our discussion on fencing, a useful hint may be given in regard to netting that has to be sunk in salty ground or country of a nature that would cause it to corrode quickly. A cheap and quick coat of enamel can be given to it with a mixture of two parts of coal tar to one part kerosene. The tar should be made hot (nearly boiling), then the kerosene added to it and kept well stirred, although care should be taken to see that flames do not go near the latter. A roll of netting is hoisted with blocks and tackle, and dipped into the boiler. The mixture goes through it almost instantaneously ; it is then hoisted up, allowed to drain a few seconds, then put aside to dry. The rolls should be dipped nearly 1 ft. into the mixture.

CHAPTER IV.

PERMANENT IMPROVEMENTS *(continued).*

GATES AND YARDS.

Five-bar Single Gate—Seven-bar Double Gate—Four-bar Double Gate—Rabbit-proof Double Gate—Sheep Yard Gates—Movable Panel in Wire Fence—Sheep Counting Gate—Gate Fastenings—Galvanised Iron Swing Flood Gates—Collapsible Netting Fence—Another Falling Flood Gate—General Notes on Drafting Yards—Drafting Races—V-pattern Sheep Yards—Yards for 10,000 Head—Yards for 5000 Head—Circular Yards—Yards for 3000 Head—Lamb-marking Yards—Double Drafting Races—Hessian for Yarding Sheep.

Having dealt fairly fully with fencing, we now pass to a consideration of the allied subject of gates, confining our attention chiefly to those made of wood and of such simple design as can be put together on the station. Patent metal and automatic gates are almost always bought ready made and nothing would be gained by describing them here.

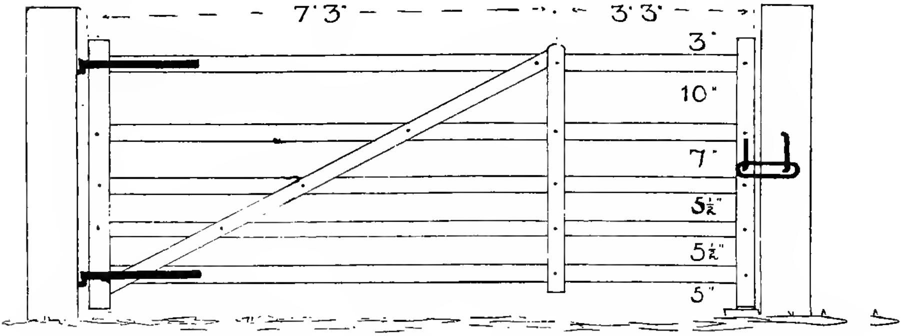
In deciding the width of a gate the nature of the traffic likely to pass through it must be taken into consideration. From 10 to 12 ft. is usually sufficient. Probably the single gate, as opposed to the double gate, has more advocates at the present time. Provided the space is not too great, the single gate is more easily made and easier to handle, besides being cheaper. Hardwood is the best timber to use in all cases, and great care should be taken to see that it is thoroughly seasoned before being made up. It is a wise precaution to paint or oil all joints thoroughly before putting the gate together. On any but the heaviest gate a single stay is sufficient, and generally speaking, a straight piece of timber securely bolted is all that is needed. A stay should run from the bottom of the butt to the top of the head, not from bottom of head to the top of butt.

The gate posts must always be entirely separate from the fence posts; never on any account hang a gate on a strainer.

Guide posts are generally advisable if there is much traffic. They should be heavy and set a little narrower than the gate, so that waggons will not knock the posts out of plumb.

Five-bar Single Gate.

The accompanying illustration shows a strong and serviceable gate, which is made from hardwood battens. The butts and heads are double ; that is to say, a batten is placed each side of the rails. 3 in. x 1 in. hardwood is used throughout, except for the butt, which is of 4 in. x 1 in. stuff. It is essential that all timber used should be thoroughly seasoned. The top bar is 4 ft. above the ground line, and the width of the opening 10 ft. 6 in. The butt comprises two 4 in. x 1 in. battens 4 ft. 3 in. high. Head same height, but of 3 in. x 1 in. stuff. Rails all 3 in. x 1 in., 10 ft. 6 in. long. Stay and upright of 3 in. x 1 in. hardwood.

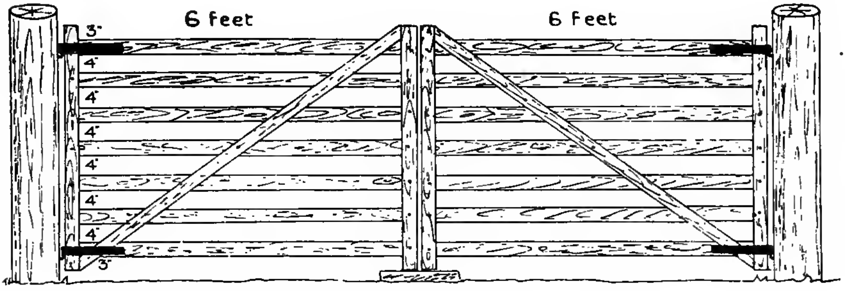


Five-bar Single Gate.

The gauge is as follows :—Bottom of butt or head to bottom of first rail, 5 in. ; top of first rail to bottom of second rail, 5½ in. ; top of second to bottom of third rail, 5½ in. ; top of third rail to bottom of fourth rail, 7 in. ; top of fourth to bottom of fifth rail, 10 in. ; top of fifth rail to top of head and butt, 3 in. The whole should be bolted and stayed as shown in the sketch. It will be observed that the stay fits flush against the edge of the butt and upright, and does not overlap either. A certain amount of packing is necessary under the hinges. After the gate is hung a red gum block should be sunk under the head to take the weight when closed.

LIGHT SEVEN-BAR DOUBLE GATE.

Light but strong double gates, giving a 12-ft. opening, and sheep and lamb proof, can be made as follows :—3 x 1 in. timber, hardwood for preference, to be used throughout ; butts and heads to be double, that is, placed each side of the bars, and to be 4 ft. 3 in. long. A space of 4 in. occurs between each bar, the bottom bar being 3 in. from the bottom of the butt, and the top bar 3 in. from the top of the butt. This gives a gate 4 ft. high, which, if thought unnecessarily high, can be reduced 7 in. by only having 6 bars. The butts and heads would then need to be 3 ft. 8 in. long.



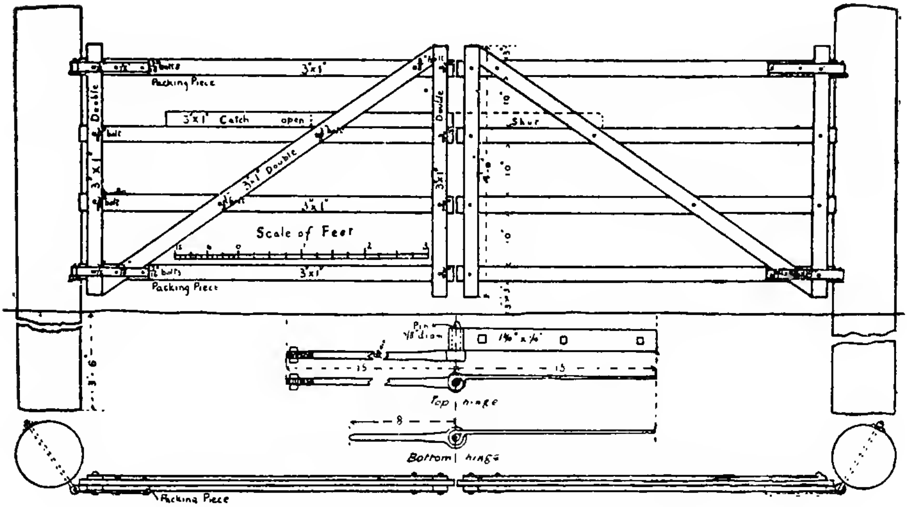
LIGHT SEVEN-BAR DOUBLE GATE.

For a gate of this description it is advisable to use bolts and nuts instead of nails at the various joins, in fact bolts are always preferable, as with a bolted gate, if a batten breaks it is easily replaced. A single stay for each gate, if securely bolted to the top, middle and bottom bars, should be sufficient. The fastening adopted is a matter of choice, but in any case it is well to have a wood block or sleeper laid in the centre of the opening on which the heads will rest when the gate is closed

FOUR-BAR DOUBLE GATE.

The accompanying diagram shows a serviceable set of double gates. The width is optional, but 5 ft. for each gate will probably be found the most convenient size. The whole can be constructed of 3 x 1 in. timber, although if additional strength is required, 4 x 1 in. may be used for the butts. If the measurements given in the drawing are followed the top bar will be 4 ft. high and the bottom of the uprights 3 in. off the ground. The gauge is 3 in.

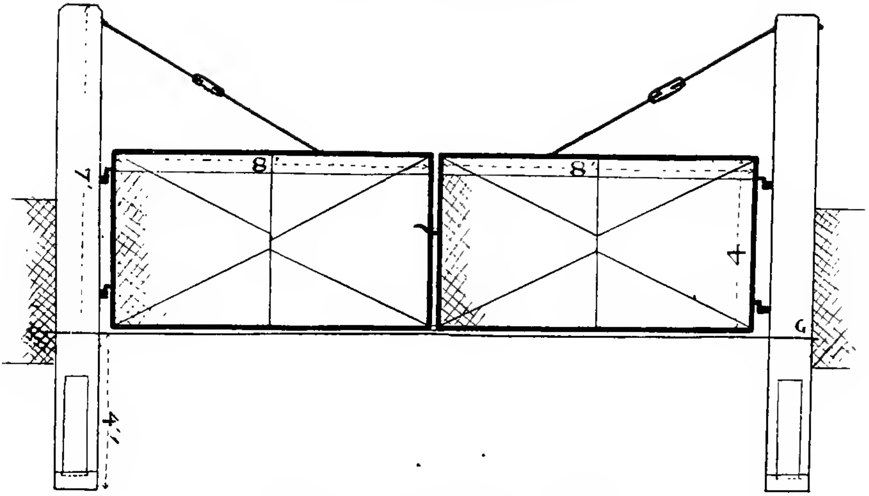
from bottom of butt to bottom of first bar, 10 in. from top of first bar to bottom of second bar, 10 in. from top of second bar to bottom of third bar, 10 in. from top of third bar to bottom of top bar, 3 in. from top of bar to top of butt. The heads, butts, and stays are double, that is, placed each side of the bars, so there is no mortising required. When the hinges are put on, a small piece of 3 x 1 in. packing is required. The fastening is made by sliding a piece of 3 x 1 along the third rail between the stays and heads.



Light Four-bar Double Gate

Rabbit-proof Gates.

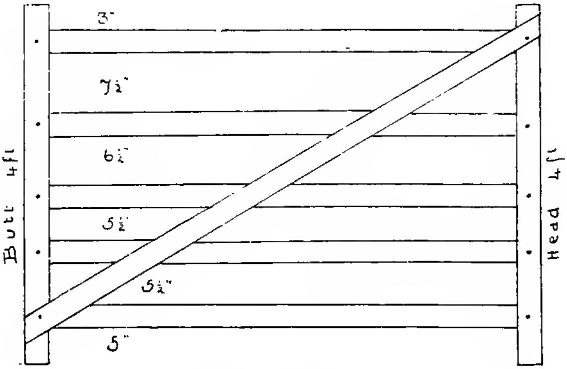
Rabbit-proof swing gates made of angle iron and covered with wire netting can easily be constructed by a station blacksmith. In the drawing provision is made for a 16-ft. opening, each gate being 8 ft. wide by 4 ft. high. The posts are 11 ft. long, being sunk 4 ft. in the soil. They need to be of hardwood, and should be at least 12 in. in diameter. About 5 in. from the top of each an eyebolt is put in to take the stays. These can be made either of iron rods or twisted wires. It is absolutely necessary if the gates are to be rabbit-proof, that they should be hung close to the posts and ground, and swing true. A wooden sill between the posts is also essential.



Rabbit-proof Iron Double Gates.

Sheep Yard Gate.

The gate shown in the following sketch is specially suitable for sheep yards and like purposes. It may be constructed to any width, from 2 ft. 6 in. up to 6 ft. The top bar is 3 ft. 9 in. above the ground line. The head may be of 3 in. x 2 in. hardwood, and the butt 3 in. x 3 in. hardwood, both being 4 ft. long. Second and top bars need to be of 3 in. by 1½ in., while 3 x 1 will probably be found stout enough for the other bars. Stay, 3 in. x 1 in. hardwood.



Sheep Yard Gate

The following is the gauge :—From bottom of butt or head to bottom of first rail, 5 in ; from top of first rail to bottom of second, 5½ in. ; from top of second rail to bottom of third, 5½ in. ; from top of third rail to bottom of fourth, 6½ in. ; from top of fourth rail to bottom of fifth, 7½ in. This leaves 3 inches from top rail to crown of butt and head. Bars and stays to be bolted as shown. All gates used in connection with drafting yards should be so hinged that they will open right back against the fence with the fastening placed as near the centre of the head as possible.

Movable Panel in Wire Fence.

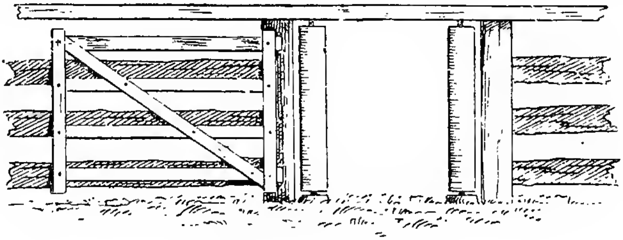
The drawing on page 59 depicts what is really a movable panel in a wire fence, and corresponds with the slips in an ordinary post and rail fence. Its main object is to facilitate the moving of large bodies of sheep from paddock to paddock without crowding and crushing at the gateway.

The opening can be made any required width up to say. 40 ft. The working of the gate is very simple. All that is necessary is to release the lever from the hook on the strut, and then to pull the gate round and lay it up against the fence. This should, of course, be done in good time before the flock comes up. After the sheep have been quietly put through, the gate is again strained up, and the lever held in position by the hook.

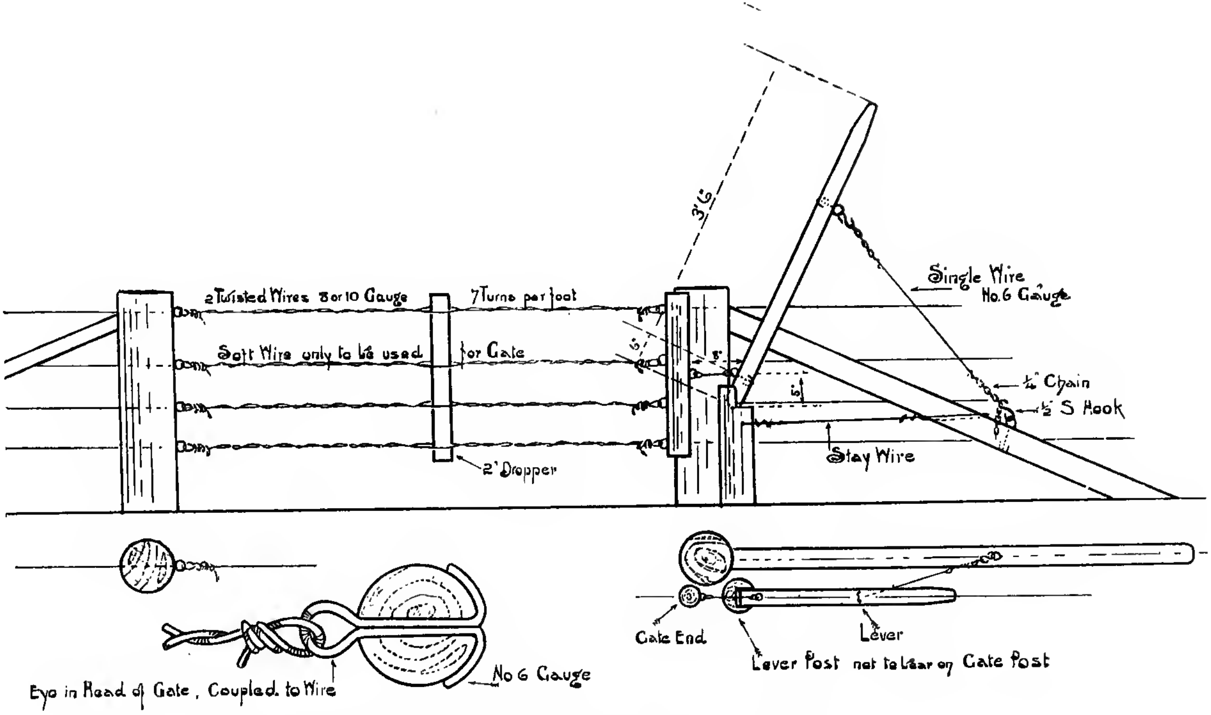
Naturally, the effectiveness of the gate depends largely upon correct leverage, and the following measurements will be found to give good results for any span from 20 ft. to 40 ft. Attachment from lever to gate head, 8 in. to 10 in. over all, fastened about 6 in. from point of lever, which should be about 4 ft. over all. Four or more droppers, according to the width, are attached to the panel to prevent the wires from becoming tangled.

Sheep-counting Gate.

The accompanying sketch gives a good idea of a sheep-counting gate, which prevents jamming. It is fitted with two small rollers



Sheep-counting Gate.

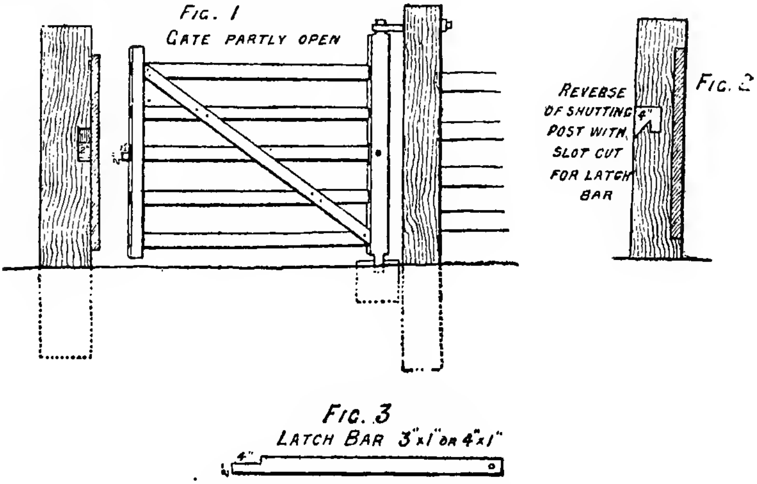

3'6"
2 Twisted Wires 8 or 10 Gauge
7 Turns per foot
Soft Wire only to be used for Gate
2' Dropper
6"
8"
5"
Single Wire No. 6 Gauge
¼" Chain
½" S Hook
Stay Wire
Eye in Head of Gate, Coupled to Wire
No 6 Gauge
Gate End
Lever
Lever Post not to bear on Gate Post

Movable Panel in Wire Fence (see letterpress on p. 58).

on each side of the gate, which work on blocks in the ground, and through the cap piece of the gate. The rollers are made of round stuff about 4 in. in diameter.

STOCK-PROOF FASTENINGS.

Sheep, of course, have not the aptitude of horses or cattle for undoing gate fastenings, but every sheep property will carry a few head of larger stock, and a few examples of stock-proof fasteners should be of use. First, however, we will illustrate a latch that is especially suitable for sheep yards, the advantage about it being that there is no peg projecting from the post to catch and injure stock rushing through.

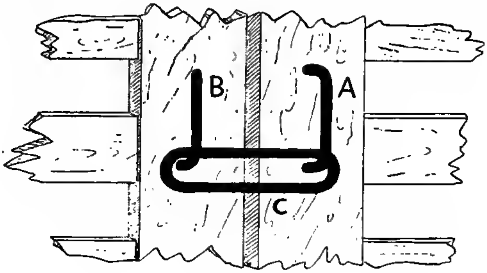


SHEEP YARD GATE FASTENING.

Fig. No. 1 shows the general arrangement of the latch. No. 2 gives a side view of the post, and shows the slot cut therein : while Fig. 3 depicts the method of cutting the latch bar. The middle bar of gate to be 1½ in. longer than the other bars, with front tenon cut to 2 in. x 1 in., so as to work in mortise 4 in. x 1 in. The back tenon should have a little play in mortise, and is kept in place by a nail or small bolt. An ordinary batten will do for the latch bar, either 4 in. x 1 in., 3 in. x 1 in., or other handy size.

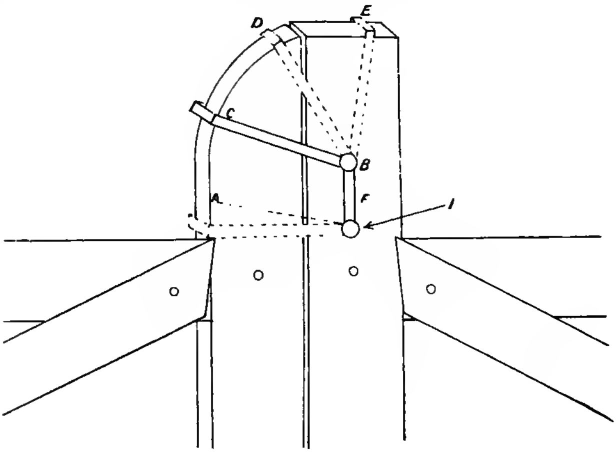
The sketches on pages 61 and 62 are of stock-proof fasteners which have all been found satisfactory in use. They are only a few of many, some simple, some very complicated, that can be seen in the country, but which are too numerous to describe. In any case, the reader's own ingenuity will probably find him a way out of the difficulty, if he is much troubled in this respect.

No. 1.—A represents a piece of stoutish iron with both ends driven into the gate head somewhere about half-way between the top and bottom. B is a similar piece of iron, but it only has one end in the gate or post, as the case may be. C is the iron link which connects the two. Of course A must be threaded through C before being driven in. The link must be sufficiently loose to lie flat against the wood when the gate is closed, and also to slip over the top of B.



No. 1.

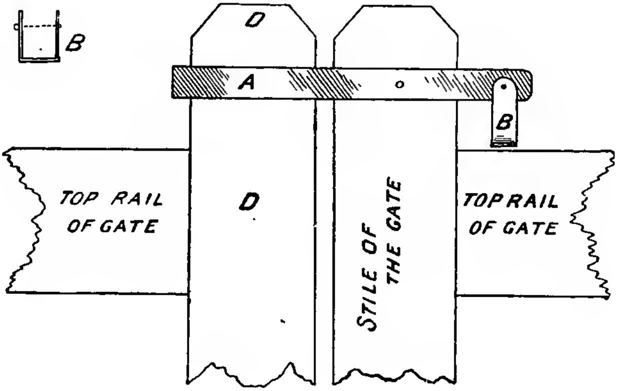
No. 2.—This, if a little more elaborate than the other fastener illustrated on this page, is neater looking and quite as effective. The only drawback to it is that it may be rather puzzling to strangers. This, however, is quite compensated for by the fact that horses and cattle find it impossible to manipulate. It is equally effective on a single as a double gate.



No. 2.

Instead of the clasp being fixed in the usual way, a slot is cut, as shown at F, 3 in. x ¾ in., through the gate or post, so that the ½-in. bolt will slide freely up and down when lifted by the hand. The clasp will not rise further than A unless the bolt end is lifted as far as B, which will allow the clasp to make the circle C D E and permit the gate to be opened.

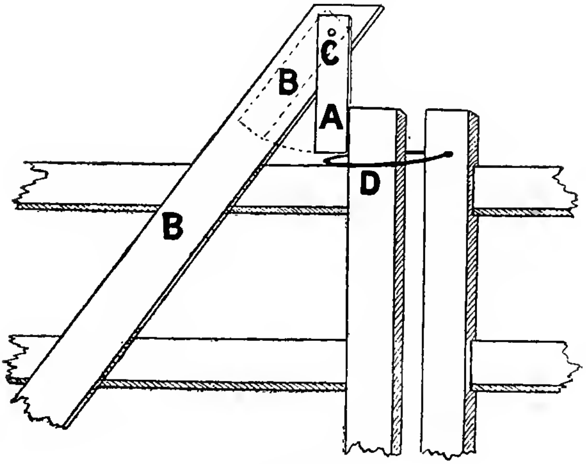
No. 3 is a more simple fastener, depicted in the accompanying drawing, and one which is also quite stock-proof. The fastener A is fixed to the right-hand head (or stile) by means of a bolt. B represents the locking apparatus. It is made of flat iron like A, and is hung very loosely from the end of A, quite close to the top rail. When A is lifted to open the gate, B, unless moved with the other hand, is brought down on to the rail, and makes an effective lock. When the gate is being opened for business it is a simple matter to toss B on to the top of A, where it will stay until put down again.



No. 3.

A simple device, such as can easily be attached to a single or double gate, which is fastened by a loop at the top of the head, is illustrated in the drawing on the next page.

The short bar A is hung from the bar B by means of the bolt C. This bolt is a shade smaller than the auger hole through the two bars, and so allows A to swing freely. A must be sufficiently heavy to always drop into place automatically. If properly constructed no stock will be able to lift the loop where this attachment is.



Loop Guard.

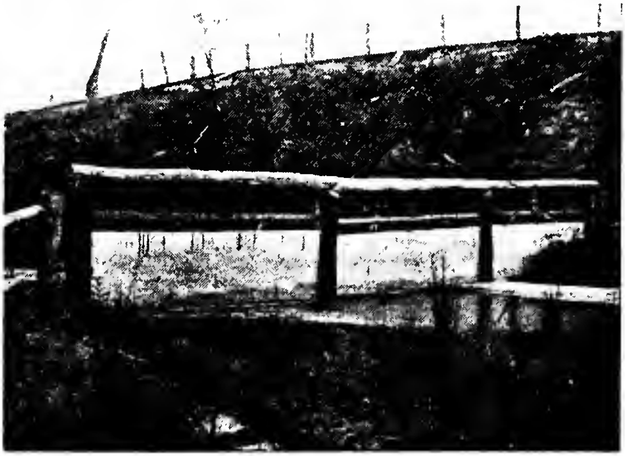
Flood Gates.

Flood gates and automatic collapsible fences is the next subject attention must be devoted to in improving a sheep property. There are many types which have been evolved during years of practical experience, but quite possibly none of those described herein may fit peculiar local conditions. However, there should be little difficulty in working out something suitable from the ideas shown.

In cases where a creek runs through country of such a nature that little erosion of its banks takes place, a thoroughly stock and vermin-proof gate can be cheaply erected on the following lines :—

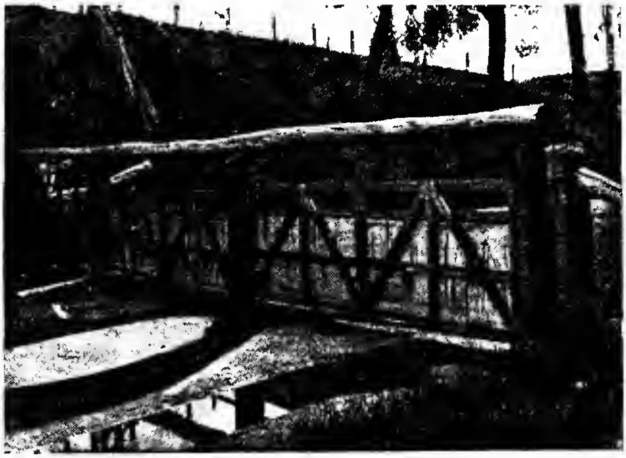
Embed a very heavy log, squared on the top side, across the bed of creek, carrying it well into the bank on both sides. Into this mortise two strong uprights, one each end, and arrange so that they are supported by the banks. These give the sill and jambs as for a door, the joist to carry the gate being fastened on top of the uprights. The gate should be made to a light, but, withal, a strong wooden frame, covered with plain galvanised iron. It can be hung to the joist with wire, and should, of course, fit the frame fairly closely. If the volume of water is likely to be very considerable, and the span is wide, it may be found better to cut the gate into two or more sections, which would swing side by side.

The foregoing idea is further elaborated in the accompanying photos. The gates depicted are swung from the joist by means



Galvanised Iron Swing Flood Gate (Down-stream View).

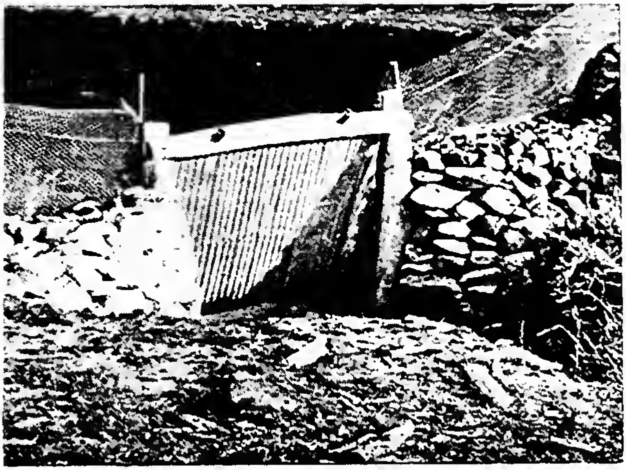
of eye bolts. The frames are made of sawn hardwood. The heads are of 3 in. x 2 in. timber, and the rails and stays 3 in. x 1 in. If



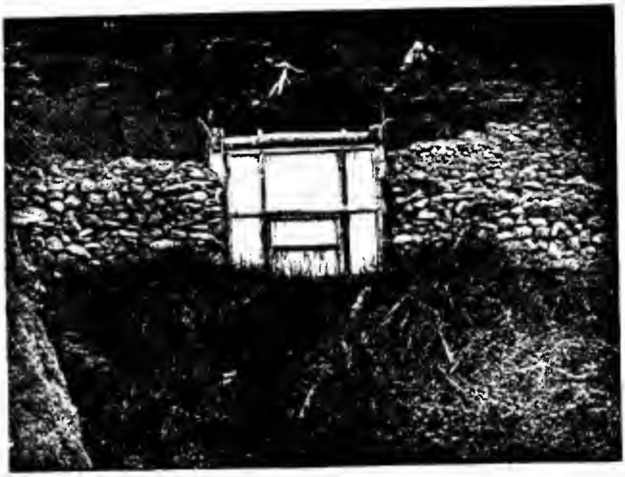
Galvanised Iron Swing Flood Gate (Up-stream View).

the gate be under 8 ft. wide, two heads are sufficient, but if over 8 ft. three, with the necessary extra eye-bolt, are recommended. The blocks are let into the heads flush, so as to allow the galvanised iron to lay flat. Good strong sheet iron is used, but it must not be made too heavy. The posts used to be fully 4 ft. in the ground, and if the soil is very soft it may be advisable to set them in concrete. The eye-bolts are fastened to the heads, not the top rails. It will be noticed the straining post of the fence is quite separate from the gate post. It is very important that this should always be the case.

The same idea, applied under slightly different conditions, is illustrated in the following two pictures. Corrugated iron is used in this case, and it is bolted to a frame of 3 in. x 2 in. timber, the whole being hinged to the top beam. The special feature in the design, however, is the small door in the centre of the lower half of the gate. The door is hung on T hinges, and gives way before pressure which would not be sufficient to operate the large gate at once, and so saves a certain amount of wear and tear and erosion. Illustration No. 1 shows how the gate is hung, and also how the junction of the fence and the gate is made rabbit-proof. No. 2, on the next page, shows the reverse side of the gate—that is, looking up stream. The small door in the lower half of the gate is plainly visible.



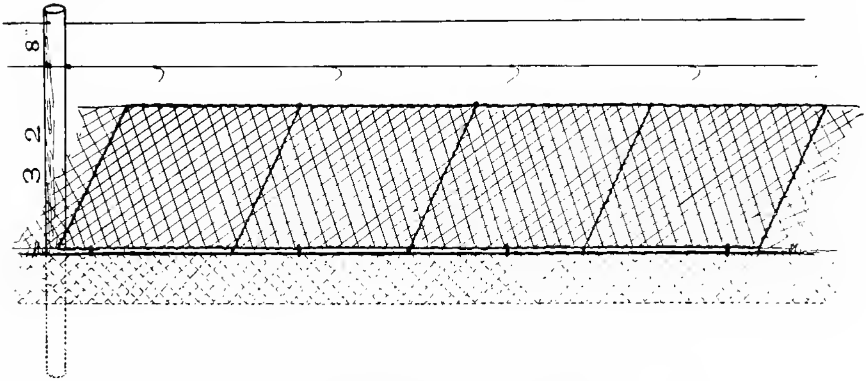
No. 1—Looking Down Stream.



No. 2—Looking Up Stream.

There is a class of flood gate, which is really nothing more than a collapsible panel of a netting fence, specially adapted for use in cases where large areas of country are liable to sudden inundation. The construction is simple, and the material cheap, only a little extra No. 8 wire being required. An indefinite number of panels or gates can be set up side by side without any additional posts being necessary.

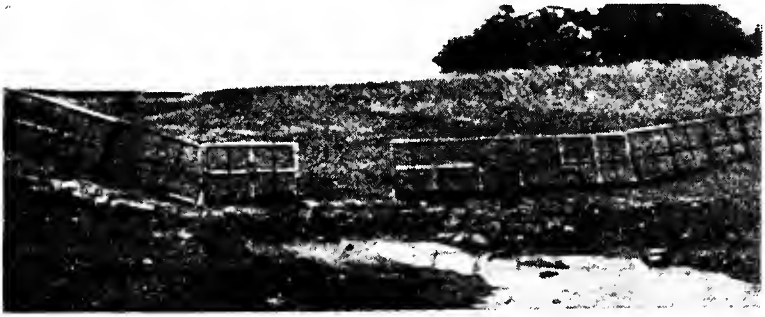
A frame is made by twisting three No. 8 galvanised wires together to length required. This is shaped over four stout pegs



Collapsible Netting Fence.

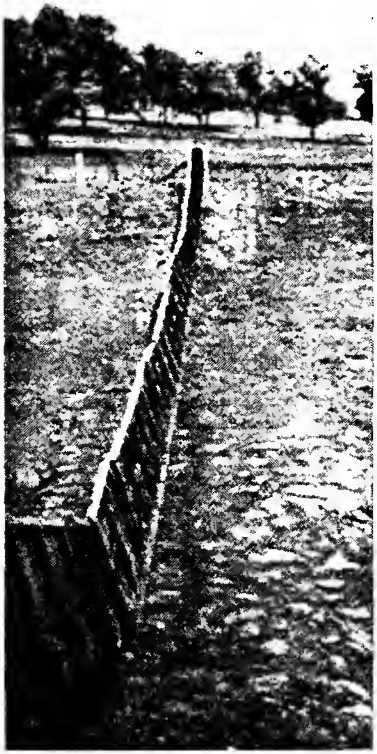
driven in the ground to represent the four corners of the panel, be it 9, 10, or 12 ft. by 3 ft. or 3 ft. 6 in. Three or four stays are attached to the frame, after which the netting is tied on in the usual manner. The netting must overlap 6 in. at each end to make a complete join with next panel of fence or flood gate, as the case may be. The bottom of the gate is tied to a stout cable made of three or four twisted No. 8 wires placed either on the line or 2 in. under the surface of the ground, and securely fastened to strong posts. The top is held in position with three or four hooks made of tie wire, and hooked on to the first wire. When any pressure of water comes down, these light hooks open out and the gate falls flat. It is a simple matter when the floods recede to lift the panels up again and bend the tie wires back into hooks. A strip of netting 12 in. in width should be placed perpendicularly in the bed of watercourse, creek, &c., and attached to bottom cable, such netting being packed with stone on each side, 7 or 8 in. deep and 3 in. wide, to prevent scour.

One other type of falling flood gate may be given, a type that is suitable for shallow watercourses, and as no posts such as would catch debris are necessary, it is specially adapted for use in timbered country, where logs are liable to cause trouble with other descriptions of gates. The gates illustrated, which are hinged on to and rest on sleepers, are 7 ft. x 3 ft. 4 in., although any size within reason would do as well. The frame and centre perpendicular brace is of 3 in. x 3 in. Oregon and the horizontal brace is of 3 in. x 1 in. ditto. The corners are shouldered and bolted, and the whole further strengthened with two ½-in. iron bolts put right through each gate. The wire netting is nailed on in the ordinary way on the up-stream side.



Falling Flood Gate, Up-Stream View.

The sleepers for the gates to rest on are bolted on top of piles. The piles can either be driven in with a monkey, which can easily be constructed of hardwood plated with iron, or sunk in the bed of the creek during dry weather. They need to be nearly 12 in. in diameter, and placed about 7 ft. apart, according to the width of the gates. The sleepers should be of 10 in. x 4 in. hardwood, properly squared. The gates are fastened to the sleepers with hook and eye hinges, the hook turned inwards. It will be noticed that the gates have a slight lean up-stream. This effect is obtained by bevelling the under side of the frame. The lean does not need to be great, not more than enough to hold the gate in position without using posts. The top of the sleepers should be about 12 inches higher than the bed of the watercourse, and supported with stone pitching to resist the scouring action of the current. Also having the sleepers raised somewhat will protect the gates when down.



FALLING FLOOD GATE.
(Side view, showing the lean, which obviates the necessity for posts).

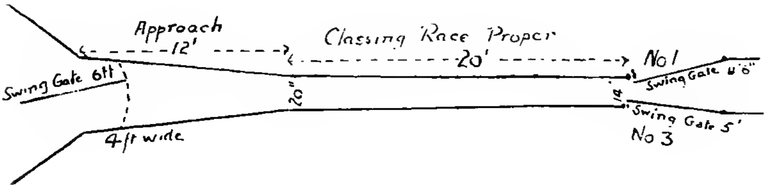
DRAFTING YARDS.

We must next consider a very important item in sheep station improvements, viz., the drafting yards. Once again, there is a wide range of designs from which to make a choice, and the most that can be done here is to give a small selection of modern yards now in use ; of course the reader will understand that the plan or dimensions of any particular yard need not be followed slavishly.

For obvious reasons the fences used in connection with drafting yards should be strong. Projections and acute angles are to be avoided. A good plan is, where possible, to have the rails so arranged that they fit flush with the inside of the posts. Round timber is the best of all to use, while sawn is to be preferred to split, as splinters may drag the wool. Likewise, hardwood is preferable to soft. The cost of sheep yards may be lessened if the receiving yards are fenced with wire or wire netting instead of rails. The strain on outside fences is not so great as on those used in connection with forcing and marking yards, or the race, and therefore they need not be quite so heavy. Sheep yard fences should not be less than 3 ft. 9 in. high. In Australia red gum, white box, ironbark and gidyea are amongst the best timbers obtainable.

The site is largely a matter of convenience. All things being equal, it is an advantage to have a site with a slight natural fall, sufficient to assure effective draining. If the yards are on a slope they should be so laid out that stock work up the hill. It may be mentioned here that all gates should be so hinged that they can be opened right back against the line of fence.

The drawing herewith shows the ground plan of an excellent sheep-drafting race, such as might be adapted to most of the yards described in this chapter. It provides for drafting into three lots. The measurements given are approximate, and can within reason be altered as thought advisable. The race proper is shown as 20 ft. long. This is given simply because it is a convenient length. Many classers prefer a race 12 or 15 ft. long, and others one of 30 ft. It will be observed that one of the gates at the exit is 6 in. shorter than the other. When closed the heads of the gates fit flush with the posts. The fence on either side of the race ought to be boarded up or closed in some way so that stock cannot see the men at the gates.



Ground Plan of Race for Sheep-drafting Yards.

RACE, WITH ADJUSTABLE WIDTH.

Another type of race, the width of which can be altered at will, is shown in the two following photos, which were taken on a New Zealand station. Fig. 1 shows the off side of the race, with the near side taken off the hinges and out of the way, and the other is a view of the near side, with the race closed to show the device for altering the width.

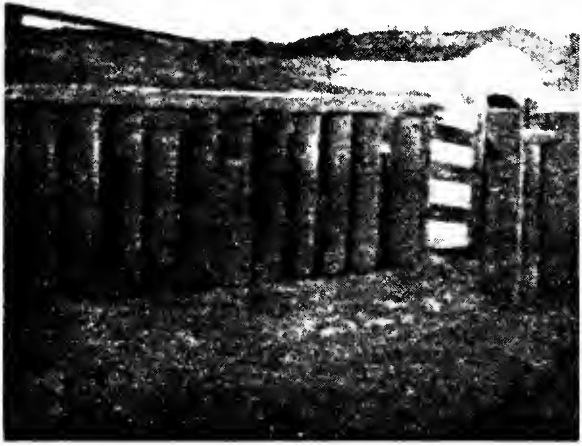


FIG. 1—OFF SIDE OF RACE.

The length of the race is 8 ft. 6 in. Two posts are put in about 7 ft. 6 in. apart, which lets the end rollers clear. Rollers are 2 ft. 6 in. x 5 in. in diameter, and those at either check of the race are 7 in. in diameter. Two 8 ft. 6 in. 4 x 2 hardwoods are checked into the posts, the lower one about an inch from the ground, and the other clear of the top of the rollers. $\frac{5}{8}$-in. holes are bored in them about 7$\frac{1}{2}$ in. apart, thus leaving about 2$\frac{1}{2}$ in. between rollers. Flat pieces of iron $\frac{1}{2}$ in. bored, and with holes for nails, are placed on top of the holes in the lower 4 x 2, and under the upper one. $\frac{1}{2}$-in. round bar iron, say, 7 in. long, with a $\frac{1}{2}$-in. washer welded on the centre, is used for the lower, and a plain bar for the top end of the roller.

A short post is set about 22 in. from roller opposite, with two pieces of $\frac{1}{2}$-in. round iron or old bolts driven in so that, say, 2 in. are out to support the notched irons to keep the near side in position. The notched iron is made of $1\frac{1}{2}$ x $\frac{1}{2}$ in., having five notches. One end is bolted to the side, and the other, the notched end, stands out about 8 in. at right angles. The race is shut by a small piece of batten, 3 x 1, which falls in a stop—a hole, say, 4 x 1, about a foot from the end, for the man drafting to alter the gauge. The gates are 3 ft. 6 in. long, and 2 ft. 8 in. high, made of 3 x 1 hardwood. The heads facing the race are rounded, and the inside bars of 3 x 1 are flush with the heads, so that the gates slip easily one on the other. The man drafting can manipulate all by grasping the top bars with the left hand. The race narrows gradually from the entrance to the exit, and the advantage of the whole arrangement is that two sheep cannot jam at the wide end, because the sheep on the roller side always has the advantage

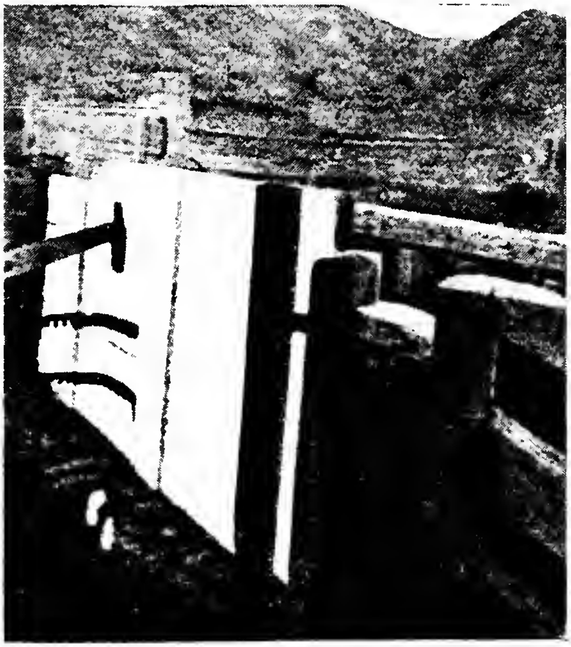


FIG. 2—NEAR SIDE OF RACE.

of the other. The more the sheep on the plain side pushes, the more the rollers help his competitor to keep ahead, and eventually to show him his tail. Sheep cannot damage each other in the race by crushing. The adjustable width permits of the advantages of the race being utilised whatever size of sheep is being handled

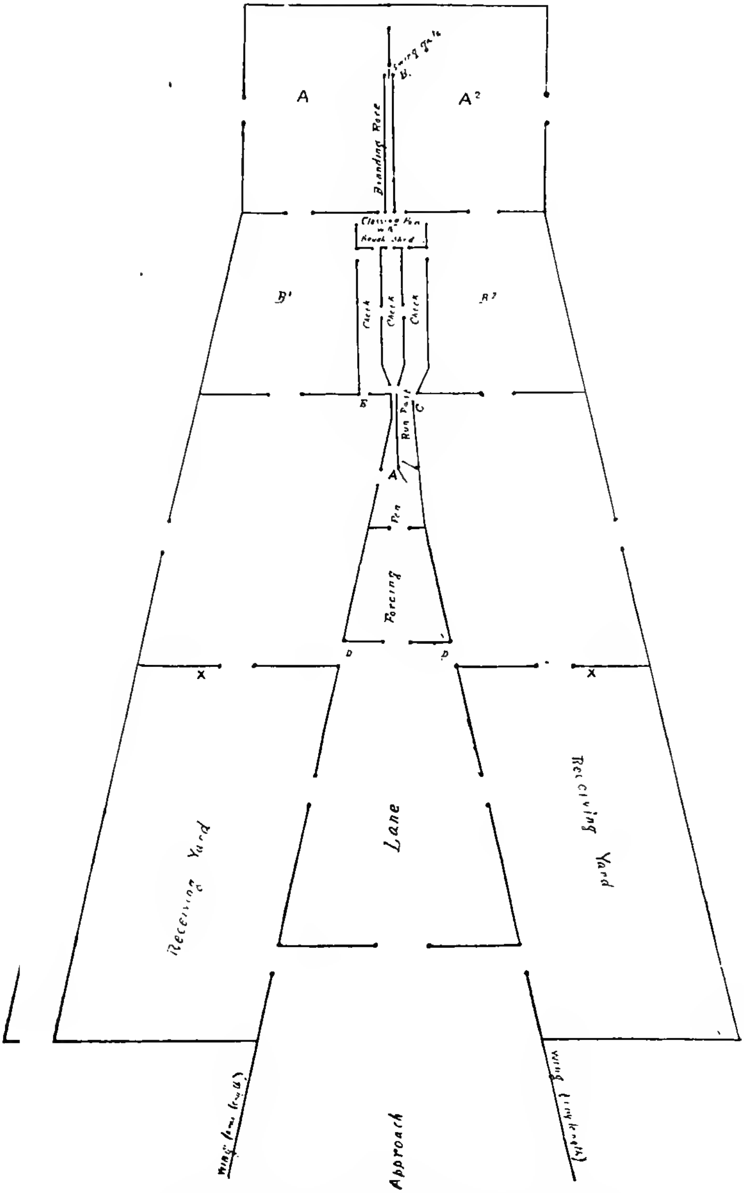
V-pattern Yards.

With regard to the actual yards, it has already been stated that there are designs numerous enough to fill a book in themselves, so we will take only a few examples of those that have proved successful in operation, and have been evolved by practical sheep-men from long years of experience. The plan on p. 73 depicts what are known as the V-pattern yards, and which are found to work with considerable facility. The leading feature is the long internal V, which, together with check and other small pens, should be built of close-railed panels or of stubs so set that sheep can see in no direction but the one in which they are required to run.

A is a 6-ft. crush gate, opening well back and acting as a sweep, when necessary, in directing the animals to the mouth of the race. The small gate adjoining it, blocking the run past, should be an open barred one, so that sheep coming up the forcing pen can see the drafted ones ahead. A "run past" will be found most useful in any kind of drafting yard. By it stragglers or small mixed lots are quickly returned for redrafting; also as a means of rapid passage forward when the narrow race is not required to be used. The passages DD are likewise very useful in returning sheep to the lane for redrafting. The swing gates at B will likewise be found a very useful asset. By it branded sheep may be separated, culls taken off, or drovers' rejects thrown out. The yards A1 and A2 may be increased in size as required, and approaches to a woolshed or dipping yard taken off them—B1 and B2 accommodating the overflow from them in event of one main line being run through. The count-out gates at E and C are useful, giving short cuts to spare yards when required. The classing pen, with its bough shade, is also an adjunct; besides checking, lamb-marking, wigging, and general odd jobs can be done in it. X or X will be found the most suitable places for "delivery count" gates.

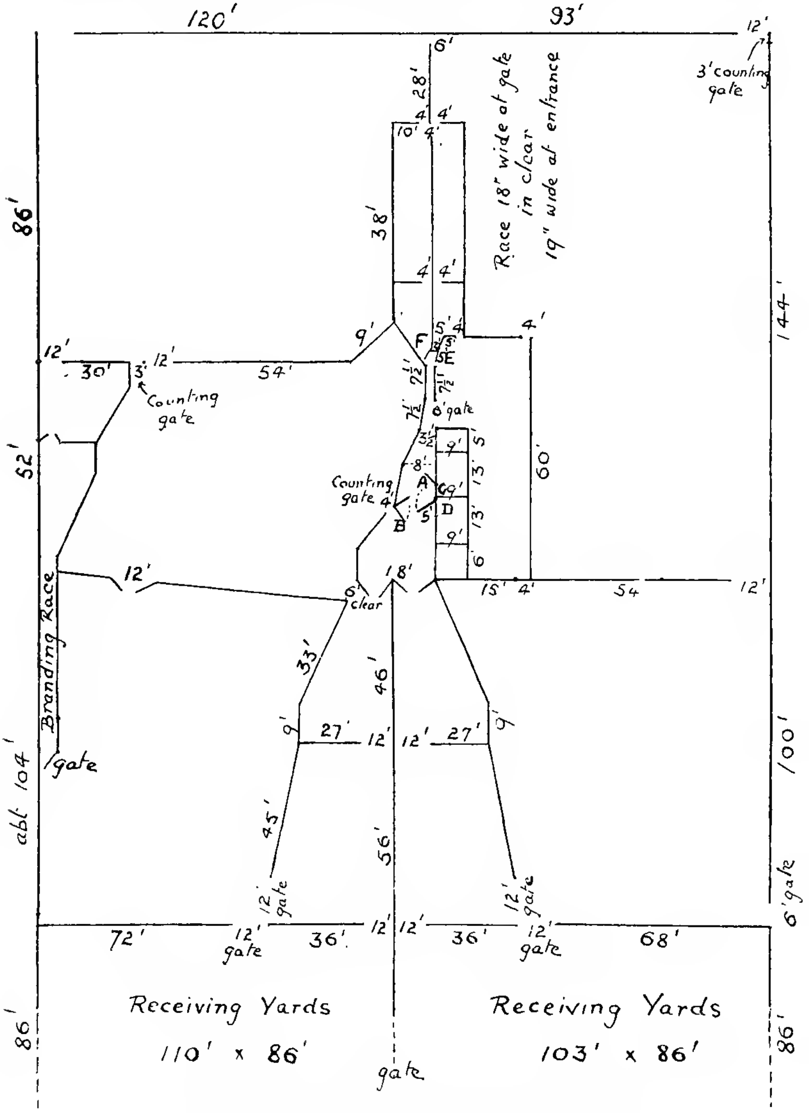
Other Plans of Sheep Yards.

The next plan (p.74) is of yards that have been worked with every success for many years on Lake Cowal station (N.S.W.), and it is said that on one occasion over 6000 sheep were drafted by three



V-PATTERN SHEEP YARDS (for letterpress see p. 72).

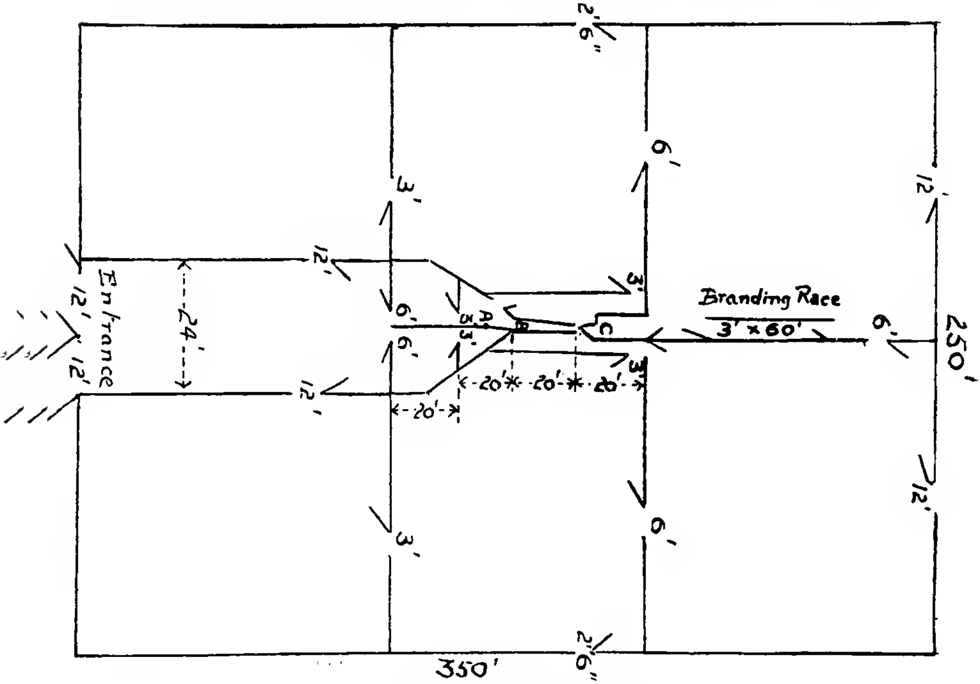
men in 1½ hours. The plan practically explains itself, but attention may be drawn to the spare gate at A, which meets the gate



SHEEP-DRAFTING YARDS, LAKE COWAL, N.S.W.

B for yarding for vaccination. Also the gates at C and D run up instead of opening. The race should be 3 in. shorter at E than at F. It should be boarded on both sides to within 3 in. of the ground, and should also be 3 in. higher at the mouth than at the exit. This stops sheep jumping, and facilitates the drafter's task in reaching down to a fallen sheep. The floor of the race is boarded, and the yards at each end of the race are corduroyed. The branding race should be low on the inside. Owing to lack of space it is impossible to show on this plan an important feature, viz., the wing which is attached to the end of the yards to facilitate yarding. This wing, which can hold 5000 sheep, is after the shape of a semi-circle, starting from the right-hand corner of the plan and swooping round to a point beyond the left-hand corner and then in a straight line inclined away from the yards.

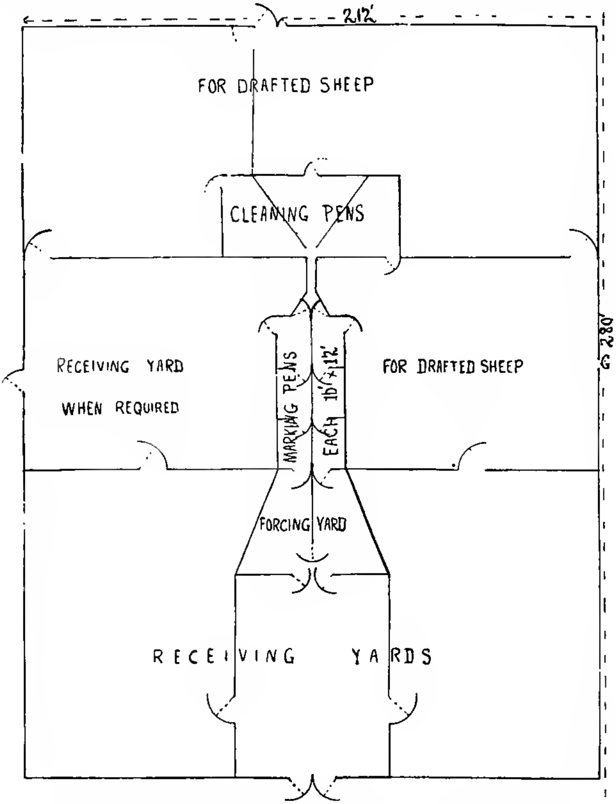
A very convenient set of sheep drafting yards is that shown in the plan on this page, but if used on a small property it will probably be found convenient to reduce the size of the outer yards.



SHEEP-DRAFTING YARDS.
To work up to 10,000 head.

The sheep approach the crush pens and race by a lane 24 ft. wide. The crush pens are triangular and divided into sections by a fence up the centre, which stops at the point marked A, a post. This post is 8 ft. from the entrance to the race, and carries a swing gate. The race, as drawn, is 20 in. wide at the entrance B, narrows down to 14 in at the exit, and is 20 ft. long. These measurements may be altered if so desired. Two gates are hung at the point marked C, the right hand one being 5 ft. long, and the left 4 ft. 6 in.

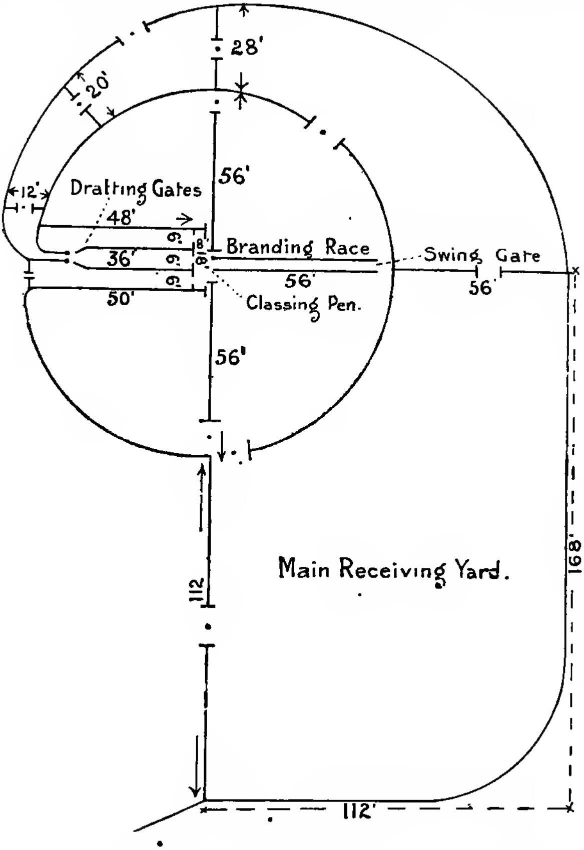
We will now consider one or two smaller yards working up to 5000 head. In the first provision is made for drafting into three lots.



Sheep-drafting Yards (to work up to 5000 head).

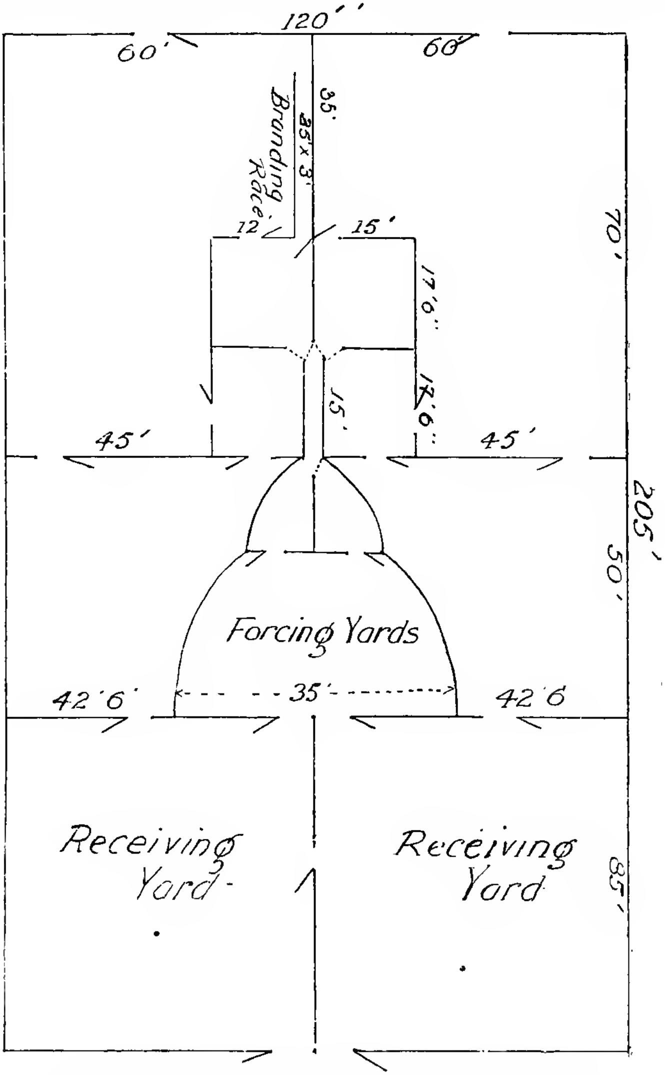
The principal dimensions are given in the sketch. In addition it should be mentioned that the race is 12 ft. long and 17 in. wide in the clear, and paved with flat stones or wood blocks. There are two waving gates, each 3 ft. long, at the end of the race, with a space of 25 in. between the posts on which they hang. The counting-out gates are 2 ft. 6 in. between rollers. (See illustration Sheep Counting Gate, on page 58).

The chief feature of the circular yards shown in the plan herewith is that the sheep always yard well, especially ewes and lambs, as the receiving gate is situated so that the lambs run right round the yard to get back to their mothers, thus practically yarding themselves. It will be noticed that the outside ring is the only portion of the fence that is not



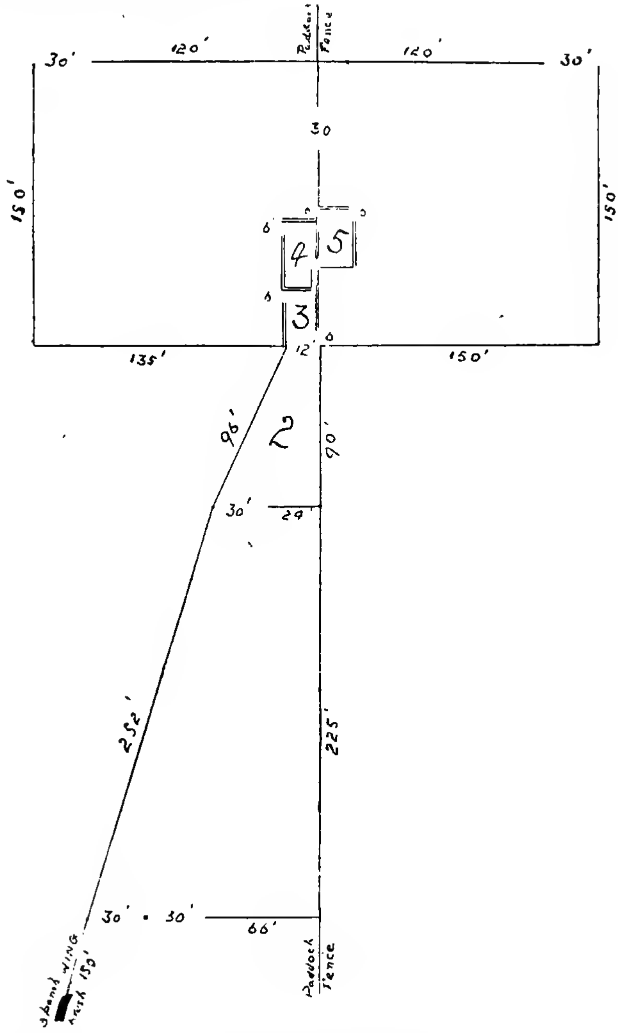
Circular Sheep-drafting Yards (to work up to 5000 head).

used for a double purpose. If sheep have to be put through a second time they can be worked round behind the end lot as they are drafted, entailing no trouble in bringing them back from one



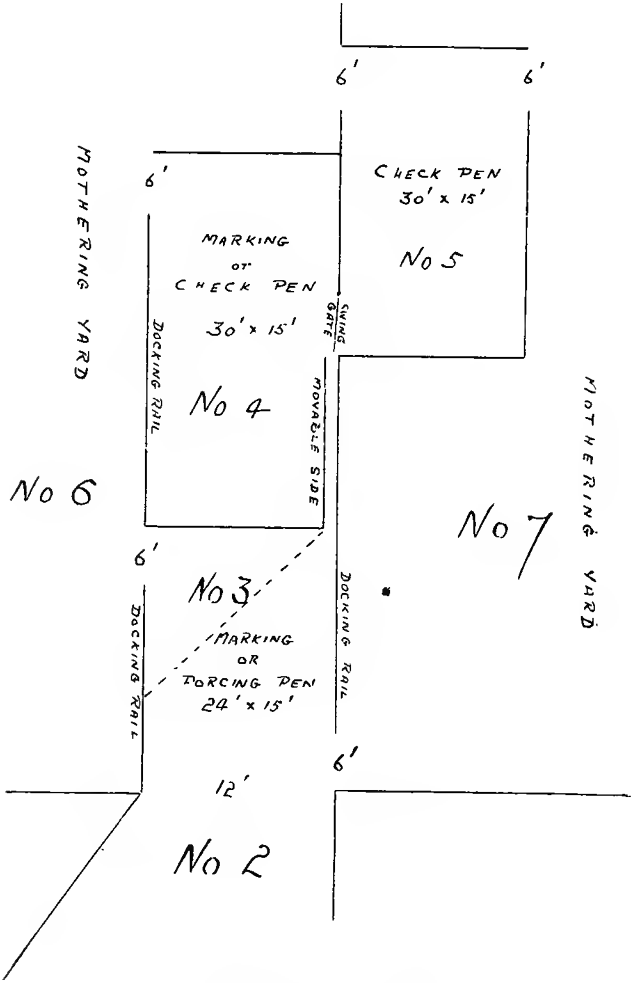
Sheep Drafting Yards (to work up to 3000 head).
(For letterpress see pages 80 & 81).

end of the yard to the other, or taking them outside. The race is 12 ft. long by 16 in. wide. Two wave gates are provided at the exit, and they enable the classer to draft into three lots. The branding race is 3 ft. wide.



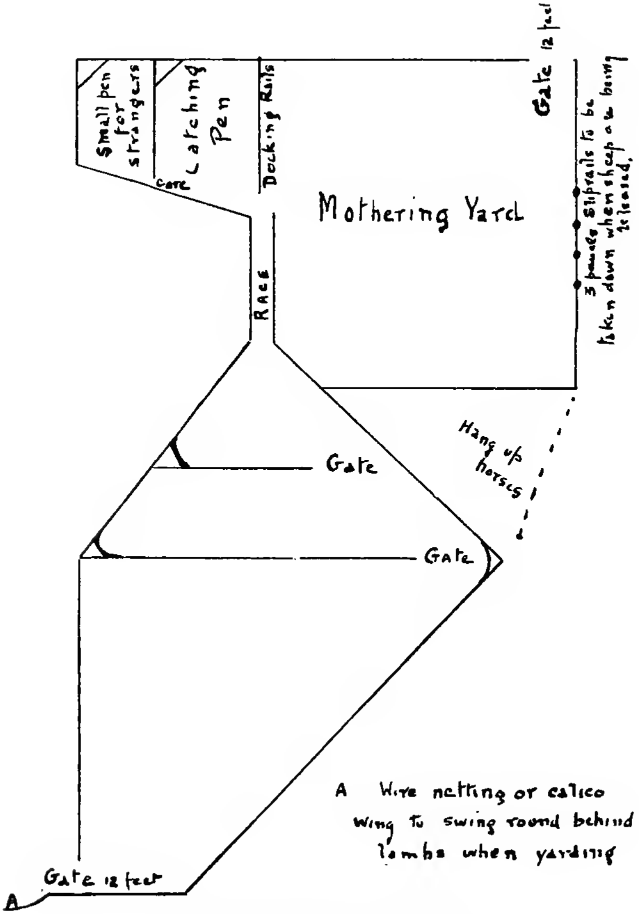
LAMB-MARKING YARDS.
(Enlarged Plan of Yards 3, 4 and 5 will be found on following page).
(For letterpress see p. 82).

One more example of simple and effective yards is shown on page 78, by which it is possible to draft into four lots, working



Lamb-marking Yards.
(Enlargement of Yards in Plan on previous page).
See page 82.

up to 3000 head. The upper portion of the forcing yard is divided into two sections for convenience of working. A swing gate about 7 ft. 6 in. long is hung on the post facing the race. As shown in the drawing, the race is 15 ft. long, 20 in. wide at the entrance, and 14 in. at exit. These measurements may be varied as fancied. There are three wave gates at the end of the race, the side ones being about 5 ft. long, and the centre 2 ft. 6 in. Four check pens, approximately 15 ft. x 17 ft. 6 in., are provided. The branding race is 25 ft. long x 3 ft. wide. All the other measurements are given on the plan, but there is no reason why they should not be altered to suit individual requirements.


Small pen for strangers
Catching Pen
Gate
Docking Rails
Gate 12 feet
Mothering Yard
3 panels sliprails to be taken down when sheep are being released.
Race
Gate
Hang up horses
Gate
A Wire netting or calico wing to swing round behind lambs when yarding
Gate 12 feet
A

LAMB-MARKING YARDS.
(For letterpress see next page.)

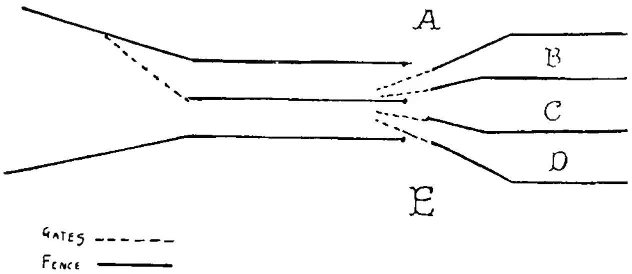
LAMB-MARKING YARDS.

Lamb-marking yards are another necessity. The actual operation will be discussed fully later, but plans of suitable yards are given on pages 79 and 80, the latter being an enlargement of part of the complete sketch on p. 79. The entrance gateway is 60 ft. wide, being two 30-ft. stock gates made of six wires, with two droppers between headpieces. The opening between the receiving yard (No. 1) and forcing yard (2) is spanned by a 30-ft. wire gate with netting attached. Single lines on the plan are cyclone fencing or wire netting, as desired. Double lines are hurdles or other timber fence. Lambs can be marked into either side before or after drafting as may be desired.

Dotted line in forcing yard (see enlarged sketch on p. 80) indicates hurdles when drafting is being done. Count-out gates are 6-ft. hurdles standing between posts; size of opening can be regulated to suit counter. Drafting race 10 ft. long, with one side hinged and movable.

Another example is shown on page 81, and a feature of it is that after the receiving yard, the yards terminate at the catching pen, which is designed so that the sheep can see straight ahead. Ewes and lambs yard easily once they are in the receiving yard, as their sole desire is to get out, and they make for the first opening, especially after the first pen is marked, as the bleating of the ewes draws them on to the front.

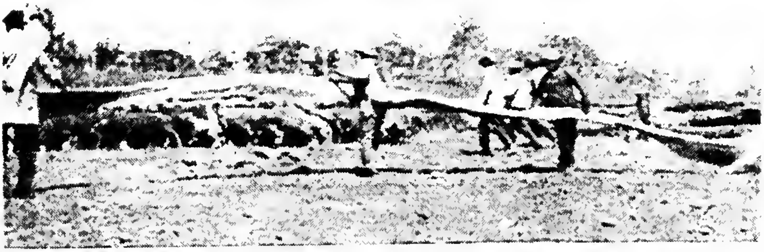
Occasionally double races are used for sheep-drafting yards. Their length and width is a matter of opinion, but the partitions should be of posts and rails so that the sheep can see from one race to the other. The outside should be closely boarded, as they generally are. One extra man is required to work the second gate. If lambs are required for the shed, the drafters run the lambs into



DOUBLE RACE FOR DRAFTING YARDS.

yard C, and ewes into yards B and D. By having two gates on each race, odd sheep can be taken off into yards A and E. The beauty of the double race is that the sheep in one race draw the others, and there is very seldom a stoppage of either for over a second or two. When only one race is required the mouth of the other is closed by a gate, which should be fairly long so as not to make a nasty angle.

In concluding this chapter a useful tip may be derived from the accompanying snapshot, which illustrates a simple device for rounding up sheep to the gates of drafting yards. It consists of a long strip of hessian, or some fairly white material, and is held by four or five men. The men simply work round the flock waving the cloth, and the stock promptly make for the gates.



Device to Assist in Yarding Sheep.

CHAPTER V

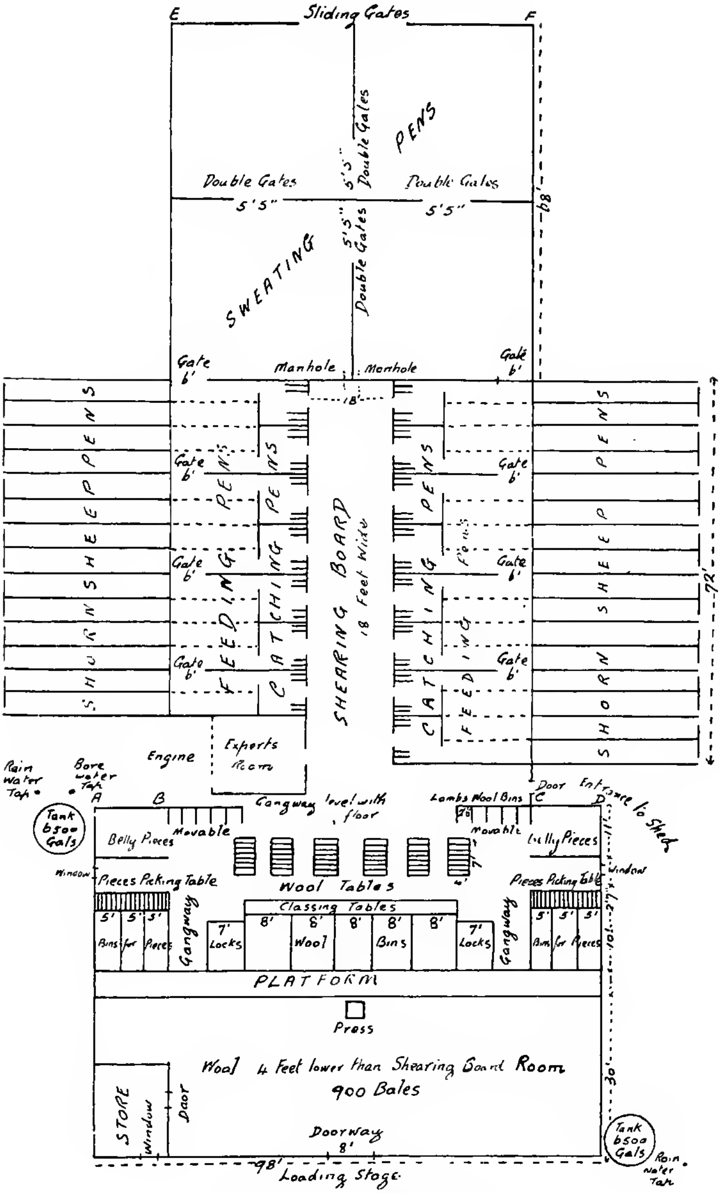
PERMANENT IMPROVEMENTS (*continued*).

SHEARING SHEDS AND DIPPING BATHS.

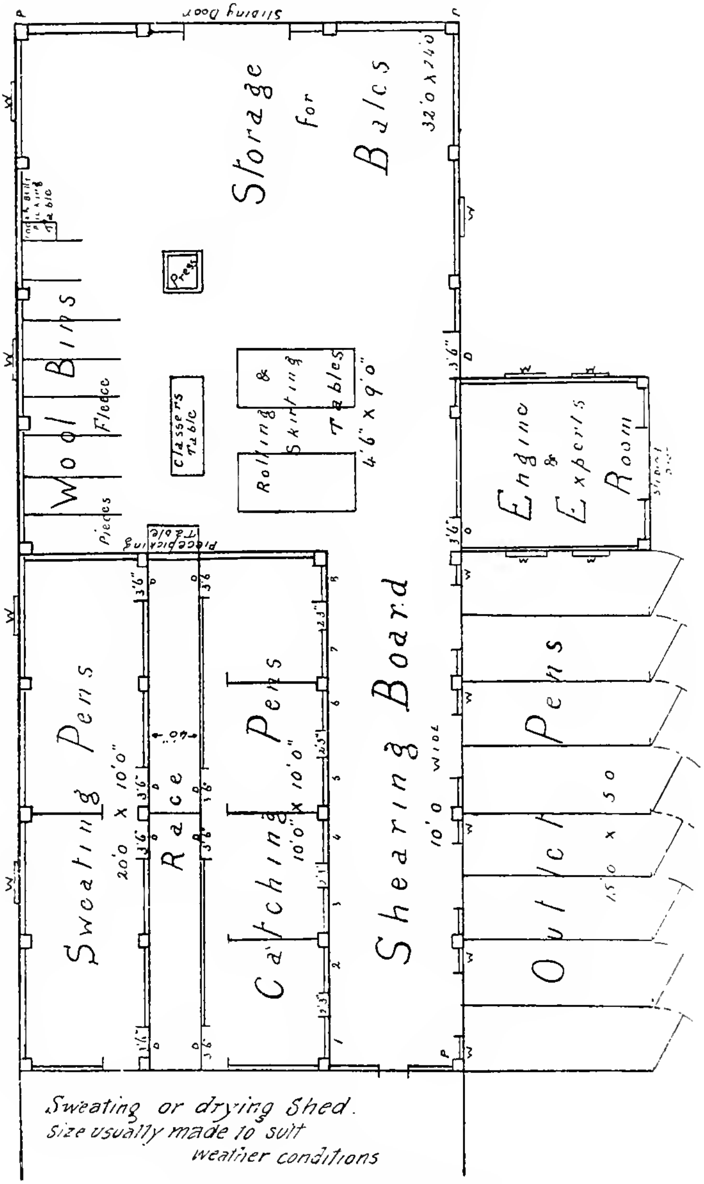
General Notes on Shearing Sheds—Some Useful Designs—Double Decker Woolshed—Shed for Six Stands—Modern Shed in the United States—Drying Shed—Shearers' and Shed Hands' Accommodation—Patent Bale Lifter—A Concrete Sheep Dip—Straight-swim Walk-in Entrance Bath—Straight-swim Plunge Entrance Bath—Circular Swim Bath—Plan of Bath and Yards—To Ascertain Capacity of Bath.

The young grazier is progressing with his improvements, and now has to consider the question of shearing shed, shearers' quarters and dipping bath. Shearing sheds should be erected on a convenient site with good drainage, and the best possible design, proved in the school of practical experience, should be adopted. Wool sheds necessarily run into a good deal of money, and mistakes in construction or design may prove expensive. If a good architect is employed, he will probably save his fee for his client many times over. The main thing to see to when building a shed is plenty of natural light late and early, and to so arrange the board, tables, bins, etc., that the wool goes on ahead all the time. If it is an end-loading shed, which is the best type, have the entrance end—where the sheep come in—facing the west; as the shed is generally filled last thing at night, the sun will then be behind them and by the time more are required next day the sun will be well up. At any rate, it is unlikely there would be any trouble with the morning sun bothering them. If the shed is on a rise, not only will it be better for drainage purposes, but sheep undoubtedly yard better up hill, as they can see the sheep ahead of them.

Have the board wide, and a solid wall between it and the pens, so that the sheep cannot be frightened when penning up. It will also probably be found to be best to have all the interior gates in the shed of the pull kind with weights, as a window draws up and down. See that all belts are running away from the men in case one breaks.



Woolshed with 30 Stands.
(See page 87.)



Sweating or drying Shed.
Size usually made to suit
weather conditions

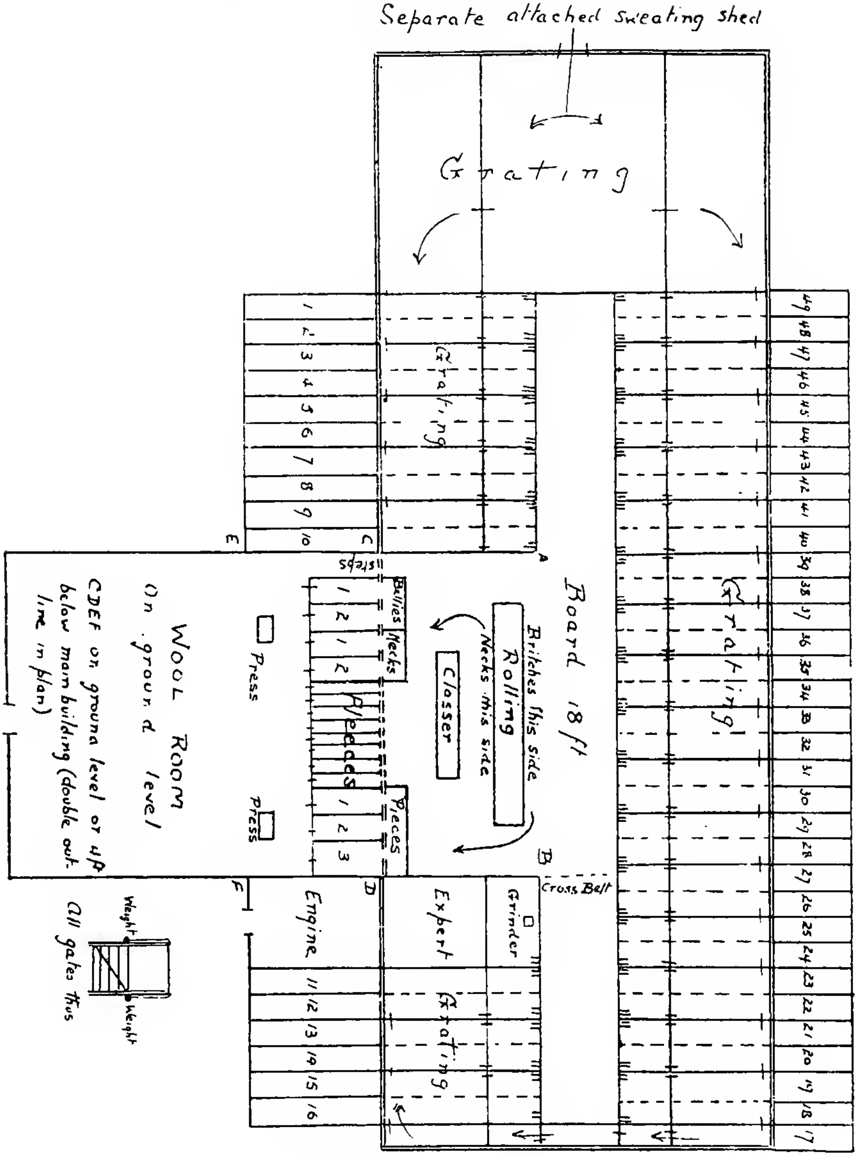
WOOLSHED WITH EIGHT STANDS.
(See page 87.)

Further advice on the interior economy of shearing sheds will be found in a later chapter dealing with shearing, but in the meantime we will consider a few plans, all of which embody sound ideas and correct principles, and which should supply the architect with a useful basis to work on. Some years ago the proprietors of "The Pastoral Review" offered prizes for designs of woolsheds, which brought forth a number of excellent plans, and we cannot do better than reproduce the winning designs with due acknowledgements to that paper.

With regard to the design on p. 85, it may be pointed out that it allows rather too much space for wool storage, space that would have been better devoted to sheep room, and also the tables for skirting fleeces are on the small side. The small 8-stand plan on page 86 is a good one, but the tables for belly wool are rather too distant from the shearing board, and some of the piece pickers' tables might be better situated. The architect who drew this plan gives some useful hints on construction. He recommends that the shed be built on wood stumps capped with tin plates, or on concrete blocks. The framing may be of sawn studs or roughly hewn posts, and the rafters exposed to view on the inside. Roof, galvanised iron; walls, fibrous cement sheets or weatherboards, The floor of the board and wool room to consist of T. and G. hardwood, and of the pens hardwood battens with sufficient space between to allow droppings to fall through. It is a great convenience to have the floor of the shed a good height above the ground, as the space underneath can be used for storing woolly sheep, thus assuring a dry supply in showery weather. It may be mentioned that sheds built on the lines of both the plans given have been erected in Australia and give satisfaction. Either design may be extended or otherwise as desired.

Another plan is that on p. 88, showing a very convenient and compact shed; it is supplied by Mr. J. B. Dowling, of Queensland, who has had a long experience in such matters. The best feature is that the wool goes on ahead all the time, and the single rolling table will be found better and faster than a lot of individual tables. Have plenty of skylights over the table, and the building should run north and south. Allow plenty of room between A and B, and have all gates to pull up. The rolling table should be 6 ft. 3 in. wide. Have a high dividing board between bellies and neck tables.

By making space A B wider, putting 16 shearers instead of 10, and extending to 70, the distance from end of board to table would not exceed 16 shearers for pick-ups. Any architect could draw a plan to scale from the accompanying sketch. Mr. Dowling states that he has shorn 7000 sheep a day with 54 men in a shed like this.

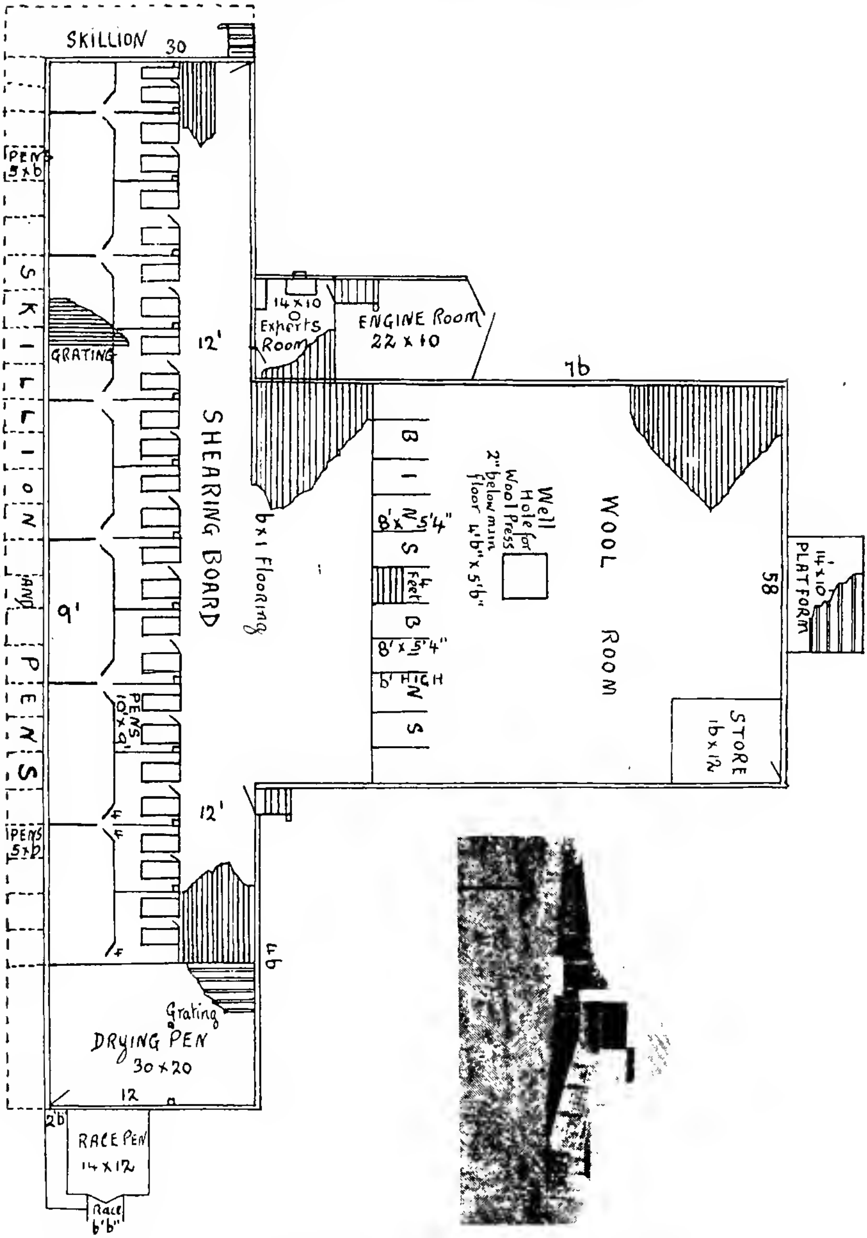


PLAN OF SHEARING SHED.

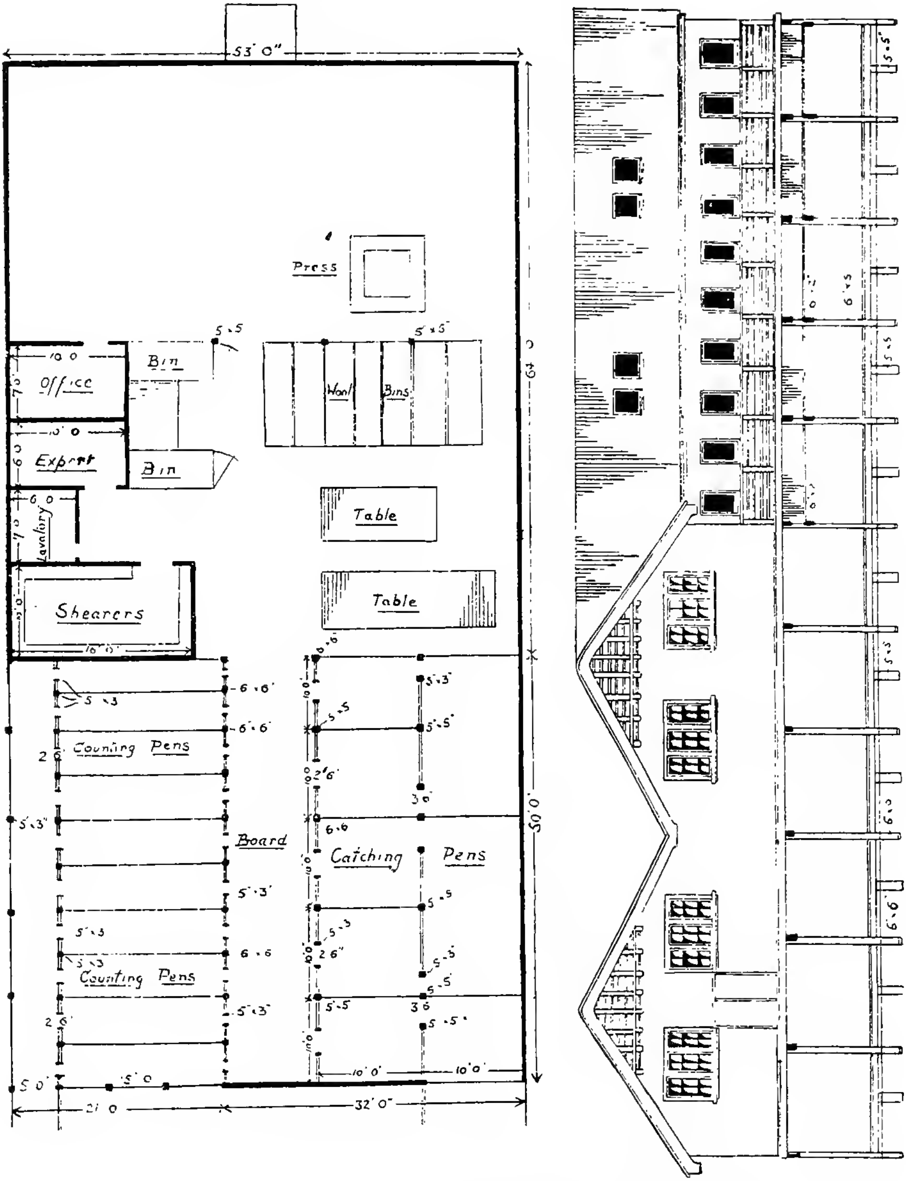
(For letterpress see page 87.)

Our next plan (p. 90) is of a woolshed erected four or five years ago at Maneroo Station, Longreach, Queensland. The shed proper, which includes the race, the pens and the shearing board, is 150 ft. x 30 ft. There are 13 catching pens, each 10 ft. x 9 ft., and the shearing board is 130 ft. x 12 ft. There are 26 stands, so it will be seen there is ample room. The wool room, the lower portion of the T, is 76 ft. x 58 ft., and the space devoted to the tables where the wool is classed is 58 ft. x 16 ft. This portion is on the same level as the shearing floor, but there is a drop of 3 ft. to the wool bins, which, 10 in number, run right across the building. Round the south and west side of the shed is a 6-ft. awning, 8 ft. off the ground, which acts as a shelter for the counting-out pens and the woolly sheep at the western end of the shed. On the western side of the wool room are the experts' room and engine room, the former being 14 ft. x 10 ft., and the latter 14 ft. x 22 ft. Access to these is gained from the board. The race and pens are floored with grating 2½ in. x 1½ in., while the rest of the building is floored with 6 in. x 1 in. The doors of the catching pens are 6 ft. high and 2 ft. 9 in. wide, and the chutes, down which the shorn sheep go, are 2 ft. x 2 ft. 6 in., and the incline is very gentle. The distinctive feature of the shed is the roof, which is circular, and the shearing floor and wool room are clear of any obstructions in the way of posts and beams. The ventilation is ample. Along the wall of the race up which the sheep go 6 ft. is left uncovered. To prevent the sheep from getting out, this is enclosed with K wire. In regard to light there are five skylights in the wool room, which also provide light for the shearing board. In addition, there is, at each end of the board, a sheet of corrugated glass.

A small shed of 6 stands that can be erected at a reasonable figure, very compact and convenient, is shown on p. 93. Such a one is in use on Calcannia Station, South Australia. All measurements, etc., are given on the plan, and little can be added to the details there furnished. The principal uprights of this particular shed are of jarrah, and the others of soft wood. The woolroom floor and shearing board of deal flooring boards; gates (sliding) and divisions of stringy bark; battens of jarrah. The building is erected on stubs 2 ft. above the ground.

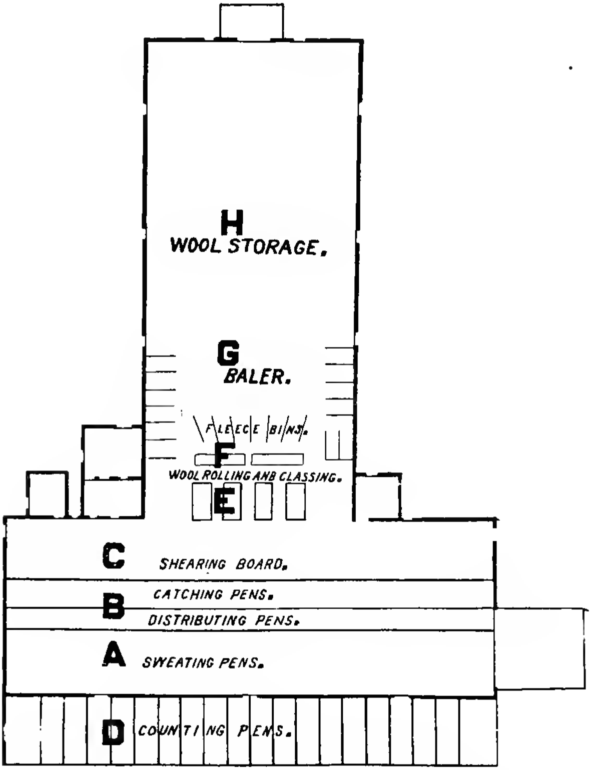


Ground Plan and Exterior View of Maneroo Woolshed, Longreach, Q.
(For letterpress see page 89.)



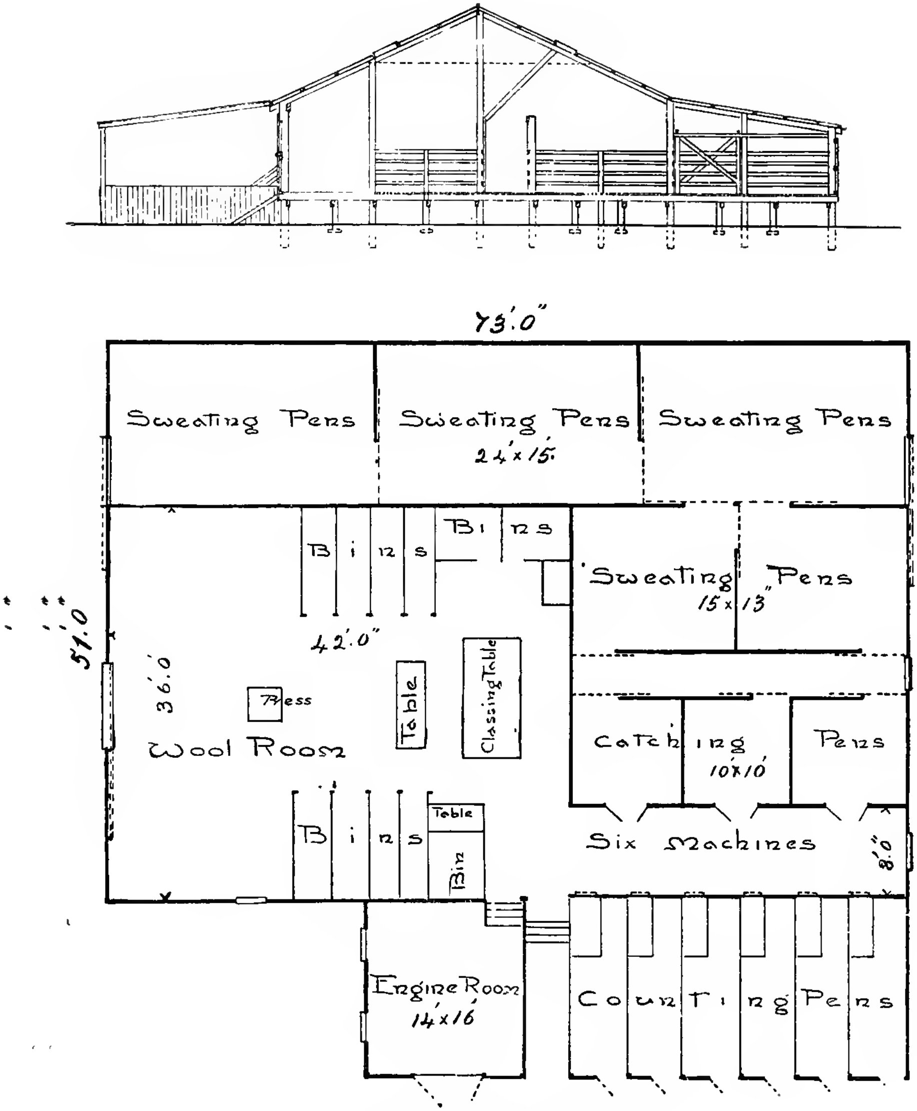
Plan and Elevation of Double-decker Woolshed
Constructed for Geelong (Vic.) Harbour Trust Commissioners.

The accompanying plan shows a modern shed in the United States, and is one of the results of efforts to introduce into the States the Australian system of handling wool. The sheep are driven up an inclined floor to the sweating pens at A. At B are the distributing pens and the catching pens, and from the board, C, the sheep are passed down an inclined chute to the counting pens, shown at D.



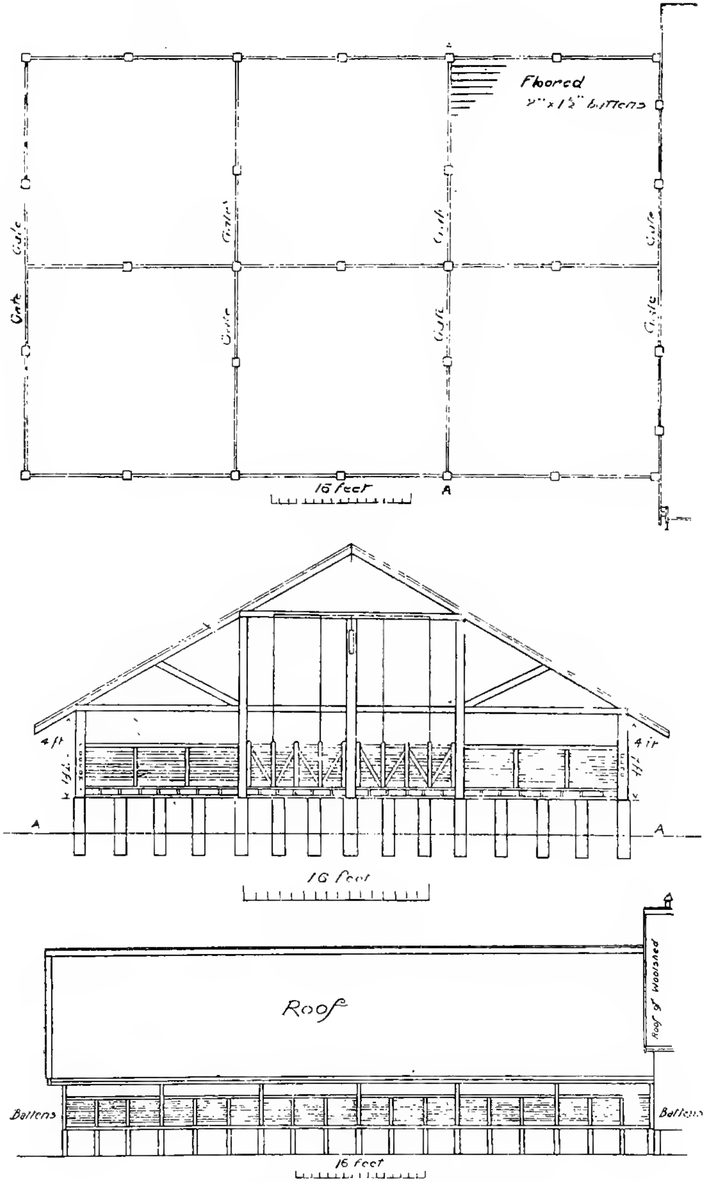
Plan of Modern Shearing Shed in the United States.

One of the greatest troubles that beset the sheep owner at shearing time is that of "wet" sheep. As a general rule, if there is the slightest vestige of moisture in the fleece the men will refuse to shear, and the owner is powerless to compel them to, even if in his own honest opinion the sheep are dry. The definition of



SHEARING SHED FOR SIX STANDS.

(For letterpress see p. 89.)



DETAILS OF DRYING OR SWEATING SHED.

"wet" sheep rests with the shearers themselves, and a decision is arrived at by a ballot in the case of doubt. Consequently if the owner wishes to obviate this difficulty he should have plenty of space under the woolshed, and fill it up over-night, so that in case of rain he will have at least a moderate run of dry sheep to carry on with, or else he can have a special drying shed. Plans of one in use in Western New South Wales are given on p. 94. Except for the end which abuts on the woolshed, it is open on all sides. This assures a free current of air over the sheep, while the wide overhanging roof keeps out even the most driving rain. The eaves overhang 4 ft. The shed may be thought rather too elaborate, but of course there is no reason why it should not be altered to suit. Swing gates might be substituted for lifting gates, and four or five rails in the partitions instead of six, as shown, and so on.

Shearers' and shed hands' accommodation is a matter that is governed by law in Australia; and Acts of Parliament making it compulsory to provide a minimum of what is termed "proper and sufficient accommodation for shearers" are in force in the various States of the Commonwealth. They are all framed on much the same lines, and apply to shed hands as well as actual shearers. Buildings, therefore, must be designed and constructed to comply with all the provisions of the Act under which the owner is liable.

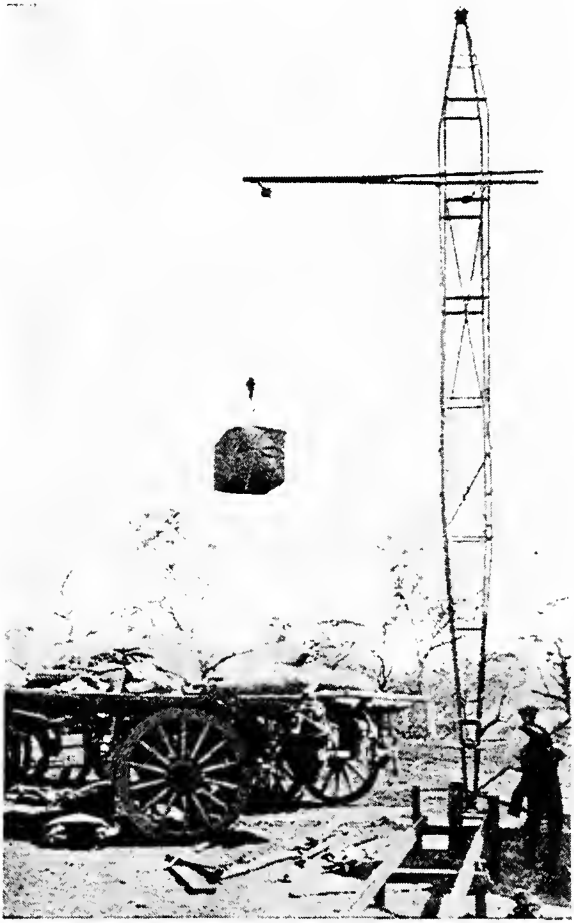
A Bale Lifter.

A valuable adjunct to the shearing shed is a bale lifter, and the following photos show something novel and effective in this line in operation on Mr. F. D. McMaster's Station, Dalkeith, Cassilis, New South Wales. The tower belongs to a steel wings windmill, which was out of commission as a mill, and the actual cash outlay of converting it to a bale lifter was not more than £5, as the pulley blocks and wire ropes had been used on the station for many years for other purposes. The cross yard-arm of heavy angle iron at the top formed the old supports of the steps leading from the dip, which were discarded for brick steps. The tram line in view leads from the shed to the bale lifter, and had been used in the old method of loading. The tower revolves on ball bearings set on concrete, round which are slots every 15 inches to take the sprag, which is a piece of 2-in. pipe bolted to the bottom of the tower for locking purposes whilst the winding is being done. The little windlass shown about 2 ft. 6 in. up, was cut out of a 5-in. solid iron roller, being portion of a sawbench plant lying idle for many years on the station. The only new parts of the whole structure are the grip hooks made by the local blacksmith.

Adjusting the Grip Hooks.

The Grip Hooks in Position.
A Patent Bale Lifter.
(For letterpress see p. 95.)

"Three teams," says Mr. McMaster, "have been loaded in an hour and a-half as against a day with the old stage system. The whole process can be worked by two men if necessary. In the time stated, loading was done by two station hands and the carriers at the waggon."



THE TRAM LINE AND TOWER FOR BALE LIFTING, WITH WINDLASS ABOUT 2 FT. 6 IN. FROM THE GROUND.

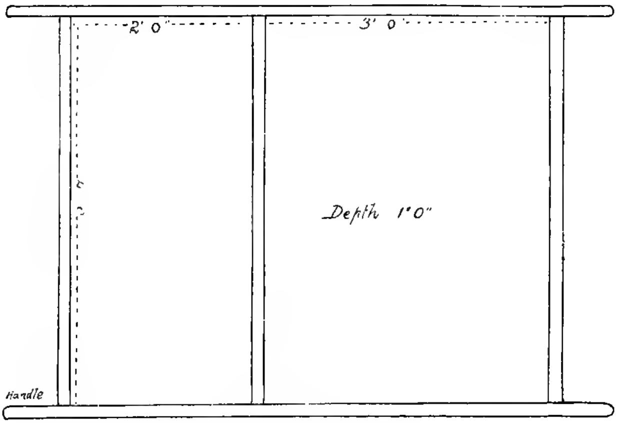
Dipping Baths.

To every shearing shed a good dip should be built, as all sheep are the better for one dipping in the year, and some can stand two with advantage. It is not proposed to go into the pros and cons of dipping at this stage, or to discuss the modus operandi, which will be fully dealt with later, but to confine ourselves for the present simply to the construction of the bath, as an essential sheep property improvement. In the choice of a bath the owner should be guided largely by the size of the flock. For large flocks the long swim principle is universally adopted, because a continual stream of sheep can be kept up, and the length of the bath ensures sufficient immersion to allow the dip to work right to the skin. For smaller flocks, say under 3000 sheep, smaller baths are recommended, but the sheep must be checked in these in order to ensure sufficient immersion.

Realising the importance of this phase of sheep management, it stands to reason that it is more economical in the long run to build a lasting bath, and therefore concrete is the best material to use, although the owner must be guided by the nature of the soil. In deep black soil, for instance, it is impossible to construct a concrete bath unless it is reinforced. In such country a steel bath will really be found to give the most satisfaction. (In all the following designs, however, the baths are made of concrete.) Iron baths can, of course, be obtained, and for small flocks are very suitable. They must be let into the ground as are the concrete baths. Occasionally one hears of a small man using a wooden bath, on account of its cheapness as compared to the iron or steel article, but its success or otherwise depends almost entirely on the soil in which it is sunk. It is essential that there be a good clay puddle around the outside of the dip to prevent leakage, and that the bath always be kept full of water when not in use. The following specifications can be adopted :—Use sawn slabs 1 ft. wide and 2 in. thick, both ends fit inside of side walls and side walls are spiked on to pieces 4 x 3, which are 2 ft. 6 in. apart, and run from bottom to top of dip ; from tops of them there are pieces spiked back from each side of dip on to logs lying parallel with the bath, which keeps the side walls from warping in. Excavation should be taken out large enough to allow one foot of clay to be placed around outside of dip from bottom to top, but unless good clay is procurable, the bath will be a failure. Also apply the following dressing hot to the side that goes next the earth :—One gallon coal tar, ½ lb. pitch, ½ pint boiled linseed oil.

Leaving wood, we now come to the use of concrete, which, as stated, is generally the most satisfactory material to use. Mr. S.

Wilson, of Lake Cowal Station, New South Wales, a sheep owner of wide experience, gives the following, and as the subject is a long one, we will quote the various phases briefly, leaving it to the intelligence of the reader to grasp minor details. "Make an excavation in the ground at least 49 ft. long, 3 ft. wide on top, 22 in. at the bottom, and 5 ft. deep for 26 ft., and make it the exact size, as it is fatal to dig it out too wide and fill in with clay behind, and further, to do so would require two sets of wall boards. One or two inches of a variation in places would not matter provided the concrete is accordingly thicker at these irregular places. The slide-in section should be 7 ft., the middle section 26 ft., and the exit section 16 ft. The dip falls fully 12 in., as shown in plan on p. 101. Make a box for measuring the stone and sand. It must be 5 ft. x 4 ft. x 12 in. deep, with the side boards protruding, to be afterwards shaped for handles. This box must have a division across it at 3 ft., and have neither bottom nor top. The full of the box of stone, broken to 2½ inches, and under, is the correct measure for the stone, and the 3-ft. section is the measure for the sand. After sand is measured off add three bags of cement, thoroughly mixing the sand and cement till it is a uniform colour. Then shovel the sand and cement on top of the broken stone; after this twice shovel the whole mass dry, taking care that it is properly mixed. Then shovel about twelve shovelfuls of this mixture into a heap on the mixing stage (which should be 12 ft. x 10 ft.), and add water from the rose of a watering can till it is like thin porridge. This quantity is ready for use at once.

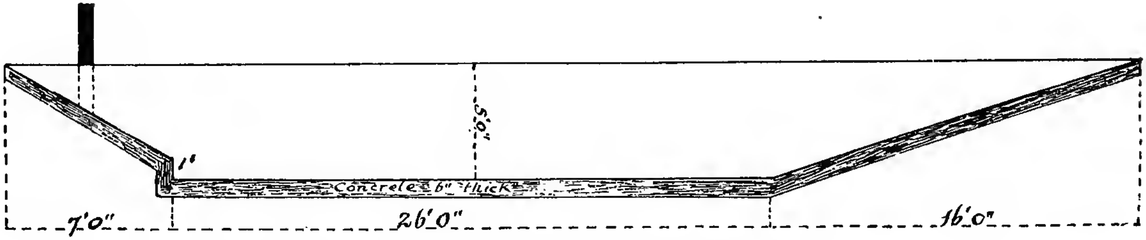


MEASURING BOX.

"Continue the measuring and mixing as directed, shovelling when ready into the boarded walls, and it will be found that four boxes of stone, plus the three feet of sand and cement, will complete one side of the dip, and with five ordinary men one side can be completed in a day to 7 or 8 inches above the surface of the ground. Prior to putting the side in, the bottom should be laid to 6 inches deep, starting at the ground level of the entrance; this can be done in one easy day, and left to set till next day. We put a sheet of No. 10 black iron 6 ft. long on the slide-in section, and cut tapering evenly from the top to the bottom. The sides of this sheet are held firm by being one inch under the walls; the top is bent to an angle of about 60 deg. and set in the concrete. The bottom is held by five nails 6 inches long driven into the concrete before it sets, that is, the first day; each nail is bent over to an angle of about 22 deg. before being inserted. Also on the first day nail the steps on in the same way on the exit. Also on the first day drive iron rods 10 inches long the full length of the floor and on both sides of it, leaving them standing out 5 inches vertical and one every foot, so that eventually they will be 5 inches up the centre of the walls.

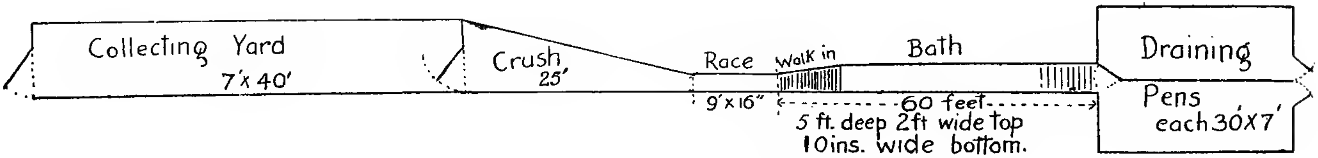
"Before commencing to put any concrete walls up it is necessary to fix in position the uprights to hold the boards in line. This must be carefully done, and lined true, with the line on the inside of the uprights, which should be at least 4 in. x 2½ in., and one will be required to every 2½ ft. They should be fastened to posts set in the ground, say 3 ft. back from the dip and 2 ft. out of the ground, by a 3 x 1½ batten. All the uprights should be 2 ft. above the surface. To hold the uprights (studs) in position jam a piece of 3 x 1½ batten between the opposite wall and the stud. After 3 ft. of concrete is laid the men doing the spade work and pulsating can work from the surface, and then add similarly fixed cross battens at the 3 ft. levels to prevent any possible warping. Boards should be smeared with hot fat prior to being placed in position. Tamping is not required, but the edge of a spade should be run along between the concrete and the board, and the board then pulsated with a hammer, which brings the finer portions of the concrete up to the boards; when this is done sufficiently no inside "floating on" of cement is required. On every 4 inches of cement set hoop-iron longitudinally, the more the better. When the floor is half laid put in wire netting the full length of the floor.

"Before making the walls of the sliding entrance, fix an iron-bark post 2½ x 2½ in the centre of the walls, and set at the requisite slope to take the splash boards, and hollow out the earth behind this post for say 3 inches to allow the concrete to fall freely down. Finish off the top of the walls with a two to one sand and cement



SECTION OF DIPPING BATH.

(For letterpress see p. 99.)



STRAIGHT SWIM WALK-IN ENTRANCE BATH.

(For letterpress see p. 103.)

mixture, and make the last 12 inches of the walls 9 inches thick, instead of 6 inches, as it is lower down. Leave the boards on each side for four days after finishing, and while waiting for them go on with the draining pens. Draining pens are easily made by putting stone, which can be up to 5 inches in size, on the surface, then wetted and rammed, and pouring on top of this stone, sand and cement, three to one, very sloppy, and trowelling it to a practically even surface.

"Dig the surface out at the outside edges and handpick the stones, setting them to the side of drain required. A fall of 2 inches from the centre to each drain is enough, and a fall of 2 inches from the furthest end of the draining shed to the well will do. Water all concrete work daily for 7 days, and put empty cement bags especially on the drains. Use 4-in. down piping set in cement for the drainage back to dip on each side. This setting in cement must be carefully done or there will be a leak. Where the down pipe goes through the concrete wall put a wooden plug fully 14 inches long into the pipe, so as to prevent the weight of the concrete making it collapse, and be sure and fix a wire on to the plug to pull it out with."

If a position is chosen with a gentle rise for the draining pens it is an advantage ; the draining pens should be at least 30 ft. x 18 ft. over all. Concrete the race leading into the dip. and concrete a few feet at the exit of the draining pens. The inside measurements of the dip, when finished, should be 10 inches at bottom, 24 inches at top, and 5 ft. deep for 26 ft. The down pipe should be soldered. It takes three lengths for each side. Mr. Wilson also suggests using 18 ft. of 4-in. black piping instead of the down piping, as it is very difficult to stop the dip leaking through the down piping. Cut the down pipe off to the requisite mitre where it fits on to the boards. Seventy bags of cement will be sufficient. Erect all posts for the entrance, exit, and draining pens prior to concreting, keeping the posts on the inner side of the drains to prevent sheep or lambs drinking the dip mixture. Before completing the portion of the wall on the side that the men will stand when working, fit a pipe through the concrete just flush for the fresh water to flow through. The tap on this pipe should be close to the tank, and consequently not protruding into the dip. Measure the dip carefully by carting the water in a 100-gallon tank and marking the measurements on two separate sticks. Measure the tank to be sure it is an exact 100 gallons. After removing the boards and filling up any interstices with 3 to 1 sand and cement, finish off the walls with a 1 to 1 very thin cement, painted on 1-16th of an inch thick with an old broom.

STRAIGHT SWIM WALK-IN ENTRANCE BATH.

The straight swim walk-in entrance is probably as satisfactory a type of bath as can be built. The prevailing belief, born of the failure of many devices to induce sheep to voluntarily enter a bath, was that they must be forced in, but it has since been proved that with a "walk-in" entrance, the natural instinct of sheep to follow their leaders is turned to full account, and once started—even old ewes—they will quite readily walk into and swim through the bath. The plan on p. 101 is intended to give, as clearly as possible, outlines of the straight swim "walk-in" method.

The measurements of the collecting yard are 40 ft. x 7 ft. The crush pen is 25 ft. long, the angle of the fence giving it a width of from 7 ft. to 16 in. This crush will hold about twenty-five sheep, and to assist in keeping the dip clean it is a good plan to provide it with a batten floor, the battens being in sections so that they may be removed after dipping. The small race is 9 ft. long and 16 in. wide, and should also be provided with a batten floor. The two gates, one at each end of the collecting yard, are 4 ft. 6 in. wide, and are so hinged that they open right back against the outer fence, closing up the corners. At the entrance to the race is a small drop gate.

The bath is 60 ft. long over all, 5 ft. deep, 2 ft. wide at top, and 10 in. at bottom. The end abutting on the race, *i.e.*, the "walk in" section, has a gradient of 1 in 2, starting from the top and leading down to within 1 ft. of the bottom of the bath, the last 12 in. being a sheer drop. The width of the slope at the point where it joins the race is 16 in., and from that it gradually widens out to 2 ft., the same as the rest of the bath. To all intents and purposes the bath is a continuation of the race. The gradient at the exit end of the bath must not be so steep, say, 1 in 4.

Covered concrete draining yards are raised at least 1 ft. above the level of the bath. The floor has a slight slope from the centre to a line of guttering on each side to carry drippings into a well, and so back to the bath. The dimensions of the draining yards are 30 ft. x 7 ft.

Mode of Operation.—The mode of working the "walk-in" plan is as follows :—The feeding and the crush pens being charged with sheep, four should be run into the race, and the little gate closed behind them. The first sheep should be forced forward down the slope until it is up to its knees in the dipping liquid, the next being quickly moved up, which, going forward with a rush, will push on the first, so that it starts swimming. Then, quickly moving up the third and fourth sheep, you have them all anxious to follow their leaders. The moment this happens, the little gate in the rear should be opened and secured, thus affording an uninterrupted passage for the sheep, which should be frightened on with a stick.

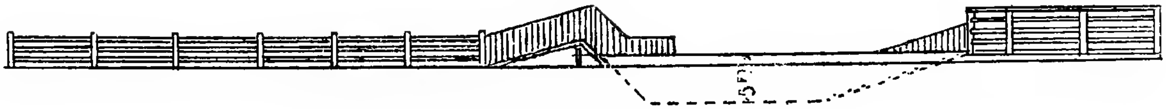
The advantages of this plan are obvious. Much of the rough treatment of the sheep, occasioned by throwing them into the bath, or letting them pitch down "side-slopes," &c., is avoided, for under this plan they take to the bath in the most gentle manner conceivable. An immense amount of labour to those conducting the dipping operations is also saved.

With regard to the materials required, for concrete, six parts broken stone, two parts clean sand, and one part cement will be needed, and for the covering cement plaster, two parts clean sand and one part cement. The bath must be made with concrete 6 in. thick, covered with ½-in. of plaster. This will require, for the concrete, 10 cubic yards of broken stone or gravel, 3½ cubic yards of clean sand, and 11 casks or 33 bags of cement. The area of the bath will be 58 square yards, to cover which with plaster will take 16 cubic ft. of clean sand and 2 casks or 6 bags of cement. There will be 75 square yards of draining floor to concrete, 6 in. thick, requiring 12 cubic yards broken stone or gravel, 4 cubic yards clean sand, and 13½ casks or 40 bags cement. The quantities for the plaster, ½ in. thick, will be ¾ cubic yard sand and 2½ casks or 7½ bags cement, making a total for bath and draining floor, concrete and plaster, of 22 cubic yards of broken stone or gravel, 9 cubic yards of sand, and 29 casks or 87 bags of cement.

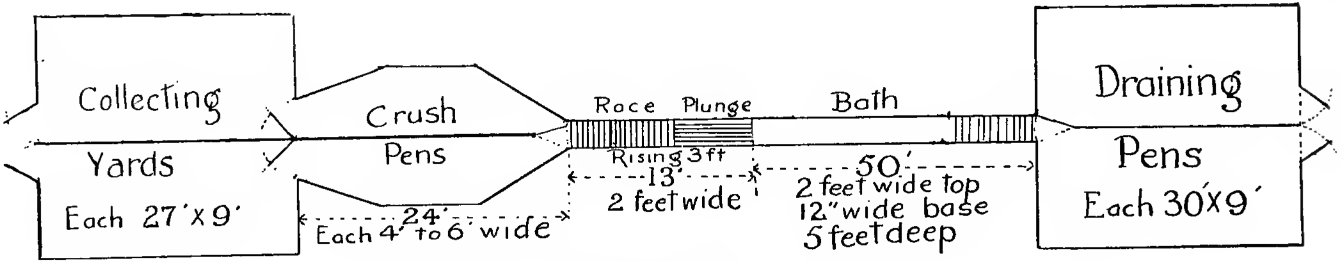
The necessary materials for the draining shed are 14 side posts of 4 x 3, 11 ft. long; 5 centre posts, 4 x 3, 14 ft. long; 26 rafters, 3 x 2, 10 ft. long; 1 ridge, 4 x 1½, 30 ft. long; 3 beams, 3 x 2, 18 ft. 6 in. long; 8 roof battens, 3 x 1, 30 ft. long; 8 side battens, 3 x 1½, 30 ft. long; 8 end battens, 3 x 1½, 8 ft. long; 8 end battens, 3 x 1½, 7 ft. long; 34 sheets 10-ft. iron; 6 lengths 14-in. ridge cap; for wings for splash-boards at each end of bath, 4 11-ft. and 4 9-ft. 3 x 2, and 60 ft. super 6 x 1 board. For gates will be needed 24 ft. of 3 x 2, 48 ft. of 3 x 1, and three pairs 18 in. tee hinges.

STRAIGHT SWIM PLUNGE ENTRANCE BATH.

A comparatively cheap and effective dip is a straight swim plunge entrance bath as shown in the drawings on the next page. The race is built with a rise in it just before the plunge is reached, serving to hide the fluid until it is too late to turn back. The collecting yards, of which there are two, are each 27 ft. x 9 ft. The forcing pen is divided by a fence down the middle, and each half can be worked independently. The length is 24 ft., and the



Sectional View, showing Arrangement of Race.



Ground Plan.

STRAIGHT SWIM PLUNGE ENTRANCE BATH.

width of each varies from 4 ft. at the entrance gate to 6 ft. in the centre. The race is 2 ft. wide and 13 ft. long, there being a steady rise to 3 ft. above the ground line in the first 10 ft. The slope leading into the bath is set at an angle of about 45 deg., the same gradient being carried right down to the bottom of the dip. The steep part of the race must be covered with sheet galvanised iron, so that the sheep cannot get a footing, but will slide gently into the water.

The bath is 50 ft. long over all, 2 ft. wide at top for the full length, and 12 in. at base. A splash wall, 3 ft. high, is necessary on each side for about the first 10 ft. of the swim. The exit has a gradient of 1 in 4.

The two draining pens are each 30 ft. x 9 ft., and are raised about 2 ft. above the bath level. They are provided with a concrete floor, having a slight fall towards the outer edge. Gutters carry the drippings to wells each side of the exit, where they are strained and run back into the bath.

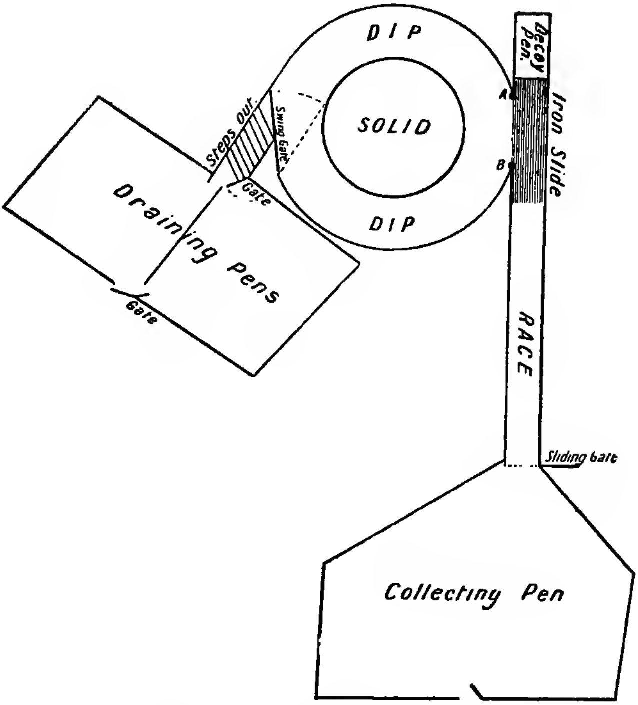
CIRCULAR SWIM SLIDE ENTRANCE BATH.

On a small property, and where labour is scarce, the class of bath known as the circular swim slide entrance has advantages, as it is easily worked, and the sheep can be controlled with fewer hands than with most baths. The diagram on the next page does not require much explaining. Provision is made for an iron slide and decoy pen. A rise of about 2 ft. 6 in. in the race should be sufficient. A curtain, consisting of a piece of sacking nailed across the rail from A to B, prevents the sheep from seeing the water. The bath is circular, with, of course, a solid centre. As the passage is not straight, the sheep cannot see the exit race, and therefore do not rush to get out. One man can control the work, submerge the sheep from any part, and also control the swing gate at the exit. The exit race does not differ materially from the usual style, except that it is at an angle, and therefore enables the sheep to get out with less effort. The bath should be made to hold 1000 gallons of dip, and 6 or 7 large sheep can be dipped at one time. From 200 to 300 sheep per hour can be dipped, each sheep receiving one minute's immersion.

PLAN OF BATH AND YARDS.

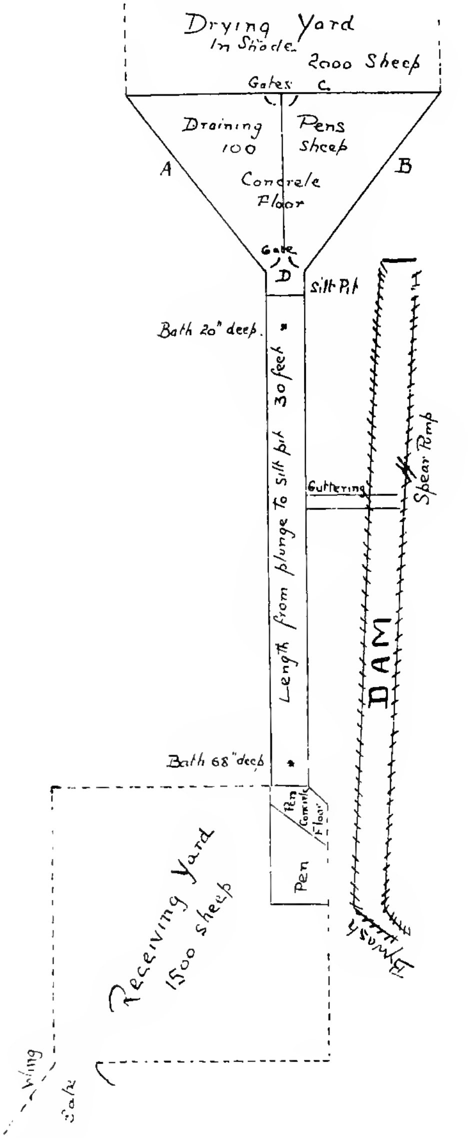
On page 108 is a rough plan of bath and yards, designed by Mr. A. Croft, Gulgong, New South Wales, and one that can be very cheaply constructed. The dimensions for excavating are as follows :—Length of bath, 31 ft. ; depth of bath at plunge

74 in.; depth of bath at exit, 26 in.; batter 12 in. in 28 in. (which could probably be made steeper with advantage). Mr. Croft puts the width of the bottom of the bath at 20 in., but I am inclined to think this rather much, as the experience of most sheep owners proves that the long narrow swim bath is the most economical. Nine inches would probably be found quite wide enough for the bottom of the bath, and 2 ft. for the top. This would allow ample room for the sheep to pass through, and such a bath is easier to work than a broad one, because the sheep follow each other through much better.



Circular Swim Slide Entrance Bath.

Mark out the dimensions with tapes and pegs. Excavate dip and draining pens. Use broken-up slate rubble for floor of draining pens and bath (about 3 in. deep), wet thoroughly, then fill over with concrete made of rotten granite (about 1-in. gauge)



Rough Plan of Sheep Dipping Bath and Yards.
(For letterpress see p. 106.)

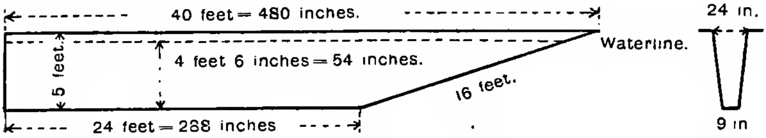
and cement (proportions 1 in 6). Keep it watered for 24 hours. Place 4-in. wood chocks against walls, 6 x 1 hardwood boards against chocks, and jamb boards with struts. Fill in with very wet concrete and ram about 4 inches at a time. Remove timber morning after completion, and put on stone coping along the top of the walls, set in concrete. Next mix three sand to one cement and plaster walls, floor, and coping about $\frac{3}{8}$ to $\frac{1}{2}$ in. thick. Keep the work thoroughly wet with bags for about a week.

It may be noted that the fall from C to D in the draining pens is 30 in. The floor from A to B dips towards the fence in centre of pens, and also to silt pit. No wash is lost. The lines A and B have a 3-in. stone coping set in the concrete. Draining pens should be floored with 1 x 1½ in. movable screens. Three men and a dog should be thoroughly able to dip 1500 sheep a day.

MEASURING CAPACITY OF DIPPING BATHS.

If you find it necessary to ascertain the capacity of your dipping bath probably the simplest way is to measure water into it through a tank of known capacity. First run into the bath sufficient water to float a sheep (3 ft. is about the necessary depth), and keep a record of the number of gallons required to do this by marking same permanently on the side of the bath. Proceed to add water in 100 gallon quantities, and mark each of these 100 gallon levels on the side of the bath up to about 6 inches from the top. A rod, similarly marked, would serve the purpose, but the permanent marking on the walls is preferable. In any event, a marked rod should be kept in reserve, in case the marks on the side of the bath become obliterated.

The following formula may be used to ascertain the capacity of dipping baths, but it requires absolutely correct working, and even then, is less reliable than the above method.



Mean length (480 + 288) ÷ 2 = 384 in. Mean width (24 + 9) ÷ 2 = 16½ in.
Depth from Waterline, 54 inches.

CUBIC CONTENTS, 384 × 16½ × 54 = 342,144 cubic inches.

(NOTE.—1 gallon = 277 cubic inches.)

Capacity of Bath, 324,144 ÷ 277 gallons = 1235 gallons.

CHAPTER VI.

STOCKING.

Choice of Breed—Stocking up—Class of Ewes to Buy—Purchasing Rams—Carrying Capacity.

Having made all his principal improvements, or having purchased an already improved property, the reader has to consider the question of stock, first of all deciding what breed he shall adopt. This is not an easy matter on which to offer advice, for so much depends on a breeder's fancy, the suitability of his surroundings, etc. Many climatic and other considerations have to be taken into account in wool and mutton production, and if a man has a fancy for a certain breed, and understands and takes an interest in its peculiar characteristics and habits, he is far more likely to be successful than if he chooses another, simply because someone has recommended it as best. Of course, there are extreme conditions in which it would be folly to attempt breeding one's fancy, but within limits, and provided the conditions of the climate and country are not actually unsuitable, it is fairly safe and a good plan to "back your fancy." The prime factor, however, must be suitability of the land. There is no "best breed." Every original breed must of necessity be the best for the natural surroundings in which it has been evolved, since these surroundings have given to it its particular characteristics. Thus every original breed may be said to be the best in the world—for its particular surroundings.

Whether it be a large or small holding, the sheep-man's best way out of the difficulty, if he has not had experience from which to decide for himself, is to go by that of others who are successful under like conditions. It may be taken as an acknowledged rule that in warm, dry, districts the Merino does best, and in the wetter and colder country some of the numerous British breeds, or crosses between them and the Merino. It practically boils down to the position that the man who intends to go in for wool and mutton production in Australia or New Zealand will run either pure Merinos or a cross; the breeder of lambs for export will use one of the many crosses, and the pure British breed will seldom be adopted for any other purpose than breeding rams for sale or crossing purposes. Cross-breeding is a very big subject, and must be left till later for fuller discussion.

On comparatively arid country, with fairly light rainfall and subject to hot summers and great extremes of temperature, a class of country that comprises a very large area of Australia, the Merino is undoubtedly the best, being so much more hardy, and therefore better able to travel the long distances necessary to get food and water. But it must be realised that Merinos are not all one type, and it has to be decided next which type is most suitable. This, again, is a matter that can best be settled by asking the advice of an experienced man who knows the country; but it can be said here that on the hot dry plains, liable at any time to be gripped by a drought, no Merino will be a success that is not of the big-framed, robust-woolled, strong-constitutioned type, with the face free from wool. Long years have adapted this class of sheep to the special environments and climatic conditions mentioned, and wherever those conditions obtain the large plain-bodied Merino will give the best results.

In buying stock, too much emphasis cannot be laid on the necessity for buying them good. They cost very little more than the indifferent ones, and there is no comparison between the two in the matter of returns. If animals are of a very mixed, nondescript sort, showing no decided semblance of character, it is very difficult and takes a long time and very heavy culling to fix characteristics so strongly that the breeder may be able to calculate approximately what style of animals his young stock may be, or be able in any way to regulate his product. It is a mistake to attempt suddenly to change the style of sheep that one may find on a large pastoral property on taking the management of it, or purchasing it, unless, of course, they are manifestly inferior. It is so costly and difficult to make a decided change in style of live stock, that, if they are fairly good of their kind, it is advisable to persevere steadily, improving by selecting the best and those showing a tendency in the direction of the desired ideal, if a change of style is desirable. If the article is really good of its kind, it will find buyers, and will command a fair price, whereas, by changing or crossing much in breeding one loses the power of controlling the style of stock being bred, and it will, in spite of infusions of any quantity of good blood, deteriorate and lose character and fixity of type. In flocks of considerable extent it would be very costly to sell off all the animals and buy another breed or type right out; in fact it is impracticable and very seldom done. The way that a change is generally brought about is by introducing blood of other types, and this is done most economically, but slowly, by using rams with strongly-fixed characterictics of the type or breed it is intended to establish permanently on the property. In order to maintain or establish fixity, and at the same time turn the stock into what the breeder fancies, or what his ideal in shape or quality may be, he should keep on steadily culling his ewes that are farthest from resemblance to that ideal, and using what sires he can find tending also in the direction of his ideal, but not of such decidedly different type as to weaken fixity of character and power of hereditary transmission. By a decided outcross the breeder loses the power of controlling the quality and style of his sheep, and in place of coming nearer a definite type, he will be producing a most indefinite class of animal, so that he will not be able to predict what his youngsters will be like or what his flock may in years turn out to be, although he may get a good proportion of lambs resembling the sort of stock he is working for.

In purchasing his ewes the intending sheep breeder should exercise great care. Whatever his fancy may be about sheep, he will see that he must select those that will prove most profitable, and, with this in view, he will find it important to purchase sheep of good carcase; by this is meant fairly large-framed sheep of symmetrical form, for with such usually goes a good, hardy, robust constitution, and good "doing" characteristics. In buying 2 and 4 tooth ewes, beware of culls; also unless the season well ahead is assured, old ewes should not be purchased by a man starting with small capital. He naturally wishes to make his money go as far as possible, and he wants to use his head, study the circumstances he is placed in, and unless he understands his business keep away from the sheep dealers, and endeavour to buy direct on some station where his agent can take him to inspect. If he has really made up his mind to go in for breeding for good and all, he cannot be too careful in getting the right sort of ewes for a start, even if he has to pay a little more and take a few less. An expert sheep-man, writing in "The Pastoral Review," says:—"I prefer buying ewes after their first lamb, whether in lamb or not, and as to whether there is much growth of wool depends on circumstances. In buying dry sheep off shears more sheep would be obtained for the same money, and if from a well-known flock they could be depended on, and the more a man can buy from the one place the better, as he then has all the one type and strain." In the case of a property already stocked, it has been stated that provided the sheep are a suitable type for the country and a fairly uniform lot, they can be retained, but if they are a bad lot, it is better to clear them out. In doing so, the sacrifice need not be great—breed does not count with the butcher. Fatten and sell them after shearing.

Having a good lot of ewes, the next matter is the choice of rams. Price should not stand in the way of getting a few good animals, for there is no need to point out the influence of the sire on the progeny, and as the rams may be used for three or four seasons, by purchasing good sires the breeder will exercise a most potent influence on the improvement of his flock for that time. It may be further advised, especially in the case of the beginner, that it is best to use rams of the same strain as the ewes, and to stick to them, although there have been instances on a large scale in Australia where the introduction of blood of a totally different type has had beneficial effects. It is a question around which a great deal of controversy has raged, but the beginner will at least be on the safe side by not mixing his blood too much. Purchasing rams is a business which requires a lot of experience, and the selector should not hesitate to ask the advice of a successful and experienced neighbour.

Do not buy rams too good for the ewes, because the reciprocating quality does not balance. For instance, just as good and probably a more even result will be obtained by putting, say, 8 guinea rams on good, well-classed flock ewes, than would be the result by using rams on the same ewes worth, say, £100. If a man mated a very high-class £1000 ram with a really good average ewe, not a stud, it is very unlikely that a better result would be obtained than choosing a ram of the right strain, etc., at about £20. People with very ordinary ewes buy very high-grade rams at big figures, mistakenly thinking they will get a high-class lot of sheep more quickly than by gradually working up.

The writer just referred to says :—" Prepotency belongs to both sexes, and sometimes the ewes show more of this characteristic than the ram. In a drop of lambs the characteristics of the sire as a rule predominate, for this reason ; in a flock of ewes some are good and some are indifferent, except in very high-class flocks. The sire is purchased after great care in examining and choosing from a large number of sheep, and is as perfect as possible for the price. Also the type aimed at has been kept well in mind when purchasing. To work from the female side would cause too much expense and other trouble, and besides all breeding is generally in sheep worked up from the sire. All domesticated animals tend to revert to the original stock, and must be constantly classed to keep the breed up to a standard. Either the ram or the ewe must represent three-fourths of the desired standard of excellence to obtain the unit. The ewe generally gives the **size** and the ram the **form.**"

Buy good, strong, well-woolled sheep if possible; avoid old sheep, unless some sound old ewes of a good stamp can be picked up at a reasonable figure, and there is every chance of getting two or three lambs out of them. The sheep that are not sold, but are given away, as we hear it said, often prove to be the very dearest of all. The soundest advice, however, that can be given to the beginner in connection with this business of securing stock, is to go and ask someone with years of experience, a man whom he knows to be a straight goer, and who is *au fait* with the country to be stocked, who knows the right class of animal to buy, and how to go about it. There are any amount of such men all over the country, only too glad to lend a hand in such a way to the genuine trier who frankly admits his ignorance and expresses anxiety to learn all that his more experienced fellow can teach him. Of course, he will have a certain amount of knowledge, otherwise he would have no right to be starting out on his own account, but it will be of a general nature, and not covering local conditions and requirements. It is impossible to convey on paper anything like adequate instructions regarding what to buy when such an enormous variety of conditions obtains, and when each of those conditions in some way must be taken into account in forming an estimate of requirements.

The type of ram and ewe to breed from depends on the country. For dry inland districts in Australia the big robust plain-bodied Merino is the sheep, while on cold, wet highlands a finer, denser-woolled sheep does better, but these sheep and this class of country will not grow into or produce the big butchers' sheep. The loss in the carcase is, or has to be, made up by breeding heavy, dense fleeces of the highest quality possible, combined with as much length as one can get, with an absence of body wrinkles.

This class of country is often wormy or fluky, and the sheep have to be drenched and carefully watched. A lot of experience on this type of land is necessary before taking it up, and it is much harder to work than inland districts.

It should always be borne in mind in building up a flock, that it is the foundation that matters. If that is well laid, there will be less likelihood of faults in the superstructure, and if they do then occur, they can be more easily bred out or counteracted. A few good sheep are better than twice the number of inferior ones. Another point that must be remembered is that in spite of all that has been accomplished, improvement can always be continuous, whether it be with regard to early maturity, conformation, or greater fixity of type. There can be no standing still, for the animal of 20 years ago is not the one suited for modern conditions even in the oldest-established breeds. Many a breeder has attained prominence, but has fallen into oblivion on account of his desire to proceed no further, and many flocks have declined in value as a result of this carelessness. Once a flock goes back in both quality and fame it is a very difficult matter indeed to restore it to its former position. Therefore it is the duty of every breeder to inspect his flock closely, and, since like begets like, every unsuitable animal should be drafted and the greatest care taken in the selection of the rams. If these laws of breeding were regarded more often, there would be in the country fewer nondescript flocks, which are often a disgrace to the breeds they are supposed to represent.

The next question is the carrying capacity of the property, for of all the dangers the sheep raiser must guard against, over-stocking is one of the greatest. It means loss of condition, and following hard upon that, deterioration or loss of wool. A contingent evil exists in the damage done to the grasses. Nothing tends more powerfully to the propagation and encouragement of inferior plant food. In most pastures there are herbs and grasses which sheep will always refuse as food, even when pressed by the greatest scarcity. The animals in feeding always select the best of the grasses, and these they bite so closely to the ground as to leave the parts exceedingly bare, while the noxious plants are able to cast their seeds, and reproduce a hundred plants where one only grew before. On the other hand, the edible grasses have no opportunity to seed, but the weeds grow abundantly. With fairly stocked pastures the case is quite different. The natural grasses have time to grow and even seed, besides which they tend to keep down the otherwise vigorous growth of useless and noxious plants. The system of over-stocking greatly determines the state of the teeth. The first effect is to deprive the animal of its proper feed of grass. There is nothing left but the tough, fibrous stems, so strongly attached to the roots that a vigorous pull does not always sever them, and the animal may be seen turning away with the whole root literally pulled up. In addition to this, the animal takes into its mouth stones and sand. Thus in a short time the teeth are worn down excessively, and some are removed from their sockets. Then, again, land that is over-stocked soon becomes foul and unhealthy for sheep to graze on. Taking everything into consideration, it does not pay the landowner in any way, for if a little is gained in seasons of abundance the losses that occur during bad seasons more than counterbalance the profits gained.

Of course, it must be realised that to apply the word over-stocking to mere heavy stocking is distinctly a misnomer; over-stocking is trying to carry more stock on a property than it can safely carry, and, as pointed out, is a practice that must end in loss. On the other hand, the grazier must not go to the other extreme and indulge in too light stocking, for although it may be a comfortable and easy policy to carry only a small number of stock on a property, and it involves little or no trouble in handling them, yet it does not follow that the property will be improved, that the stock can be turned off fatter, or that the returns per acre will be greater. As with over-stocking, so with light stocking, the less enticing feed is left to the last ; in the former case, however, sheep are forced to eat some of it, but in the latter it is probably not touched at all, and though the good grasses have an opportunity to seed, so have the bad also. Moreover, on some country light stocking will allow rushes, eucalypti and other rubbish to obtain absolute mastery. As a consequence no stock will fatten, and in a very few years first-class grazing land is liable to become very second rate.

It will be seen, therefore, that as in most things in this world, there is a happy mean in the number of stock that should be carried on a given piece of country. To begin with the owner or lessee should make sure that he is on the safe side, and as time goes on he will find out what his property, year in year out, good season and drought, can safely carry. He should then stock a little lighter than the ascertained capacity, eating off closest in the spring months the parts that are most likely to be devastated by bush fires should such occur. Protect any open plains or broken country by good breaks, and always leave plenty of plants to seed. It is a good plan to remove all stock off good country, or a part of it, from when the herbage begins to seed till it is shed ; they can then be returned and stocked a little on the heavy side to eat off the seeded stalks before rains take all the nutriment out of them. It is a foolish policy to eat off everything while it is growing, a sort of living on capital ; by judicious stocking good nutritious pasture plants grow, many of them drought resisting, that die right out under over-stocking

Water—and good water at that—has a great deal to do with the stock-carrying capacity of land. If sheep have to travel a long way to bad water they do not thrive, become discontented, and consume, or at least waste, more grass. The stock-carrying capacity of an estate and its value is really ruled by the water supply in a bad season ; and, on the whole, not enough attention is given to the providing of abundance of good water when it could often be done at little expense.

Stock do not enjoy drinking mud and filth. If they have not good water, they lose condition immediately, be the feed ever so good.

CHAPTER VII.

THE BREEDS OF SHEEP.

THE MERINO.

It is not within the province of this book to enter into a detailed history of the Merino; rather is my aim to deal with the sheep as we know it to-day, but before actually discussing its qualities, good and bad, and its peculiar characteristics, a few general notes may be given. The Merino is in the front rank of the sheep-breeding world, and although we hear a great deal in different quarters about crossbred wool displacing Merino, it can be taken for granted that the latter will never play second fiddle. When we speak of Merinos, it must be borne in mind that the term does not cover a breed of sheep all the individuals of which are of one fixed type. Such is far from being the case, for so distinctive are certain types that they might almost be taken for different breeds. Just as in Australia there are different styles of Merino, so there are in the United States of America, each style having been evolved by nature, assisted by breeders, to suit certain climatic conditions, and there is a wide disparity in the appearance of the various types. A certain class of Merino growing a certain type of wool is found on high cold country, and another type, different in appearance, particularly with regard to size and in quality of wool, is grown on the hot dry plains. These are the two main types in Australia, but between them there are others, really variations of the first two, and which on account of the success of those who originated them, often bear their names and have a large following.

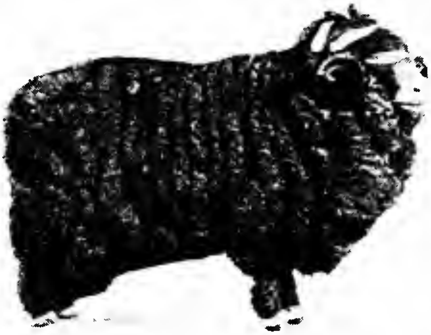
The history of the Merino in Australia is one long record of progress, and although mistakes have been made and breeders have been carried away by fashions that have eventually proved to be no good to the industry. those mistakes have been rectified and the bad influences eliminated. The Merino is the aristocrat of the sheep world, and in the right hands he is a veritable gold mine. He is in reality the foundation of Australian prosperity, and the debt that is due to the pioneer breeders who improved him out of all knowledge, is greater than we can estimate. There can be no more fascinating, and with ordinary luck, no more lucrative business than Merino sheep raising, but it must be realised that without genuine keenness, practical knowledge and pluck, there can never be success.

Supposing then that the young grazier has improved his property, and decided to stock up with a Merino flock. The first consideration, which is a *sine qua non*, is to obtain the type that is best suited to his country; it would be ridiculous to buy a mob of ewes bred on high cold country, of a small fine-wool type, for hot, light-carrying, light-rainfall country. In this question of choice of type, however, he will have the experience of surrounding growers to guide him, but it is necessary that he should know the points of a good Merino. A model sheep of the breed, with a first-class combing wool, should be covered all over the back, belly and legs with an even quality of soft, bright wool, extremely dense everywhere, filling the hand well when grasped. It should open freely from top to bottom; each fibre should be independent of any other; should they entangle or in any way cross one another, the sheep should be culled. The yolk should be clean and glistening, and a sticky, cheesy, gummy yolk is to be avoided. The top of the wither should be a solid mass of wool; any sign of wool being short and leaving a furrow is a sure indication of a light fleece. A poor sheep in wet weather will often show a parting along the back. Too often a nice quality of wool on the back is found with a coarse, hairy breech and thighs. The difficulty of covering a sheep with a really even fleece is very great, but it is much to be

A TYPICAL MERINO RAM.

desired. The legs should be covered with wool right down past the knee joints, and it used to be the fashion to have the face woolled also, but it is preferable that it should be open, and of a soft creamy satiny tinge. The horns are another important matter. The small, mean, close-set horn often goes with a poor constitutioned sheep; it should be wide-spread, nicely-corrugated and set far enough from the side of the head to enable a man to insert his fingers between it and the head of the sheep.

The most important part of a Merino fleece is the wool off the back and shoulders, and in breeding sheep special attention must be given to this part. It is practically the "roof" of the sheep, and it has to stand the racket of the weather. It has to keep out the rain and sun, the dust and the rubbish, and if a sheep is "slack on top" the fleece there will soon be in a very bad condition. The most magnificent covering down the sides, on the points, and on the belly will not compensate for a serious defect on top, and one only has to see a bad-backed fleece on the wool table to realise this. Another defect that is very often seen is the depression behind the shoulder known as "devil's grip." This means a decided loss of some of the most valuable wool, and probably indicates constitutional weakness into the bargain. Then, again, a very common fault is a slackness over the rump. Often sheep will be opened with a nice, firm staple on top of the shoulder and over the middle of the back, but when it comes to the rump, there will be found a soft, limp, light staple that offers little protection against weather and dirt.

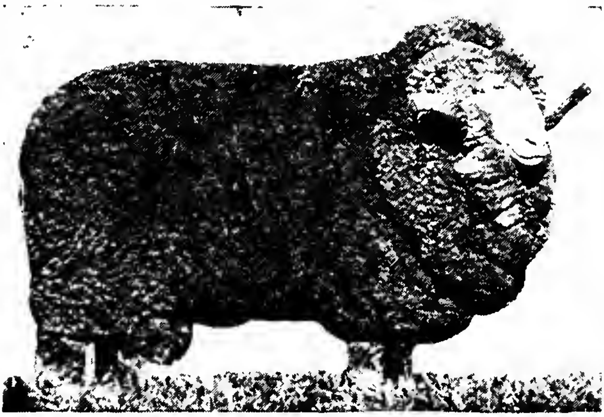


AN EXAMPLE OF THE WRINKLY MERINO OF 15 YEARS AGO.

We now come to the matter of folds and wrinkles, a subject that has caused more controversy in connection with Merino sheep than anything else in its history. When the Vermont craze was at its height and Merinos were fair imitations of concertinas, with wrinkles from head to tail, fold development reached the limit The idea was that the greater the surface of skin, the more wool could be grown upon it, which was perfectly true, and sheep were cutting up to 50 lbs. But it began to be realised that this could only be done at the expense of the sheep's constitution, and the fashion died out. It can be imagined, in parenthesis, how entertaining would be the views of the modern shearer if asked to shear a few thousand sheep of the type illustrated.

However, folds were not altogether eliminated. They are now retained on the neck, and occasionally one sees a small fold or two on the thigh or body of a stud ram, but the true "concertina" (at least as far as Australia is concerned) is as extinct as the dodo. It may be wondered why, in view of the present dislike of wrinkly sheep, some Merino breeders use sires showing a little development. The reason is that such a ram mated to plain-bodied ewes lacking somewhat in density of fleece will get stock themselves plain-bodied, but having just that density that was wanting in the dams.

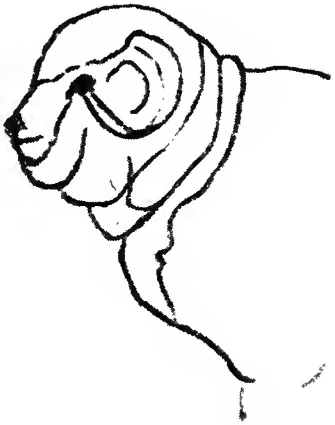
It is often asked by people having only a slight acquaintance with sheep, "Why not breed Merinos free from big neck-folds? Surely they are more shapely to the eye, and must be easier to shear?" They would be easier to shear undoubtedly; but whether a sheep with a plain neck is handsomer than one with two or three



A RAM WITH GOOD HEAD AND FRONT.

good deep folds is very questionable. From the experienced breeder's point of view, the former certainly is not so favoured as the latter, for all the leading flock-masters are agreed that the ram with a good neck-fold and collar is the better looking and more profitable wool producer.

This style of neck is easily shorn, and allows a growth of first-class wool. It should be long and deep on the underline, from brisket to jowl, and carried on a broad, strong, but short neck on top, closing the wool up as much as possible from the horns to the withers. Sheep of this class, too, are generally full of vigour, and are good thrivers, especially when free from body folds and wrinkles.



THE TYPE OF HEAD AND NECK TO BE AVOIDED.

Care should be taken that the folds are not so close and deep as to defeat their own object, and shut out the light and air, thus producing between the folds a sweaty, fuzzy wool of a low type. On the points of neck folds the wool is somewhat stronger than the average of the fleece, and unless the sheep be an extra good one these points have a tendency to hairiness, as also have other folds on the thigh and the breech. This is one defect in many rams with otherwise good necks and thighs.

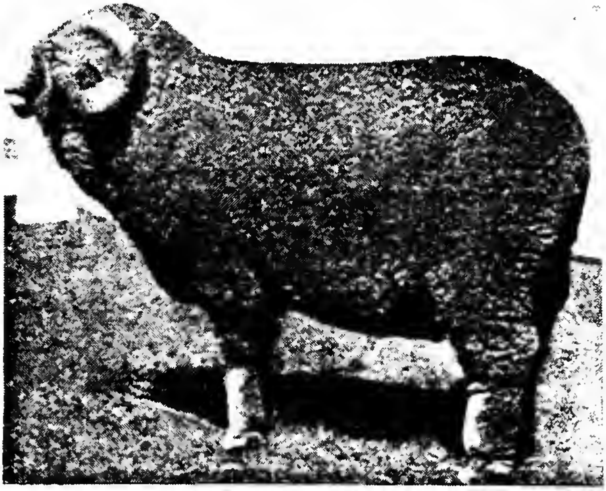
As already stated, not many years ago heavy folds and wrinkles all over the body were considered fashionable, but breeders soon found that by cultivating folds anywhere on the body excepting on the neck or behind the elbow, they were sacrificing too much evenness of fleece for quantity, and losing far too much vigour and robustness of constitution. Sheep carrying too heavy neck, body and thigh folds have a tendency to unevenness of fleece, and are bad doers. As the tendency of the standard Merino wool is to become stronger from the neck back to the breech, this coarseness becomes greatly accentuated as the size and closeness of these folds increase. For these reasons, and on account of the tendency to thrive badly, wrinkled sheep have gone out, and the plain-bodied type is the pattern of to-day.

At the same time, it is as well to realise that there are occasions when a little development about the thigh or body of the Merino ram is not a bad point. The modern Merino sheep is more or less an artificial animal, with a tendency if left alone to depreciate both in quantity and quality of fleece, and in order to keep up to the required standard, it is therefore necessary to keep on selecting as sires animals of somewhat extreme type having the desirable characteristics, such as density and weight of fleece, strongly developed. This is especially the case if the ewes which a man has to work upon are of inferior quality and markedly deficient in those characteristics. For example, to produce from ordinary flock ewes a good, dense, well-covered and improved progeny, it will be necessary to use rams of a somewhat more pronounced type, and if a good full neck and broad thigh is sought after, the rams will probably require to be well folded in the neck and with some slight tendency to one or two folds about the rump, and at any rate a broad square tail will not be amiss. Of course, there is a mean. The man who eschews wrinkles altogether, and fancies a longish free combing wool, will have to be careful to avoid a type of flock sheep that is very plain, light cutting, open and faulty, weak on the points and belly, locky behind the shoulders and feathery along the back and on the rump. On the other hand, the man who goes bald-headed for wrinkles, density and mere weight of greasy fleece, that is to say, overdoes the business, is likely to find continually cropping up in his flock a wrinkly, short, hard, gummy sheep, comparatively dense perhaps, but with a wasty, low-grade uneven fleece, and a tip like a scrubbing brush. Each breeder must, therefore, judge for himself how far he can afford to encourage or develop the tendency of most, if not all, dense-woolled Merinos to grow wrinkles and folds, always remembering that he must have a *quid pro quo* in increased weight of wool, for after a certain point the development of wrinkles *must* ensue in an increased difficulty in keeping up constitution and evenness of fleece.

As showing in an interesting manner how folds were evolved on Merinos, the following set of photographs is unique. It shows an almost unbroken line of descent from a ram cutting only 12 lbs.

of wool to a ram cutting over 36 lbs. for 12 months' growth, and defines most clearly the type of sheep which produced the 12-lb. fleece, and its gradual evolution towards the type producing the 36-lb. fleece. The line of descent is from the famous old Tasmanian Merino ram Sir Thomas, lambed in 1868, and sold in 1874, to Patron II., champion at the Campbell Town show, Tasmania, in 1910. Every ram in the line was bred entirely from Belle Vue blood, on the well-known Belle Vue Estate (Tas.), the property of the late Mr. Jas. Gibson.

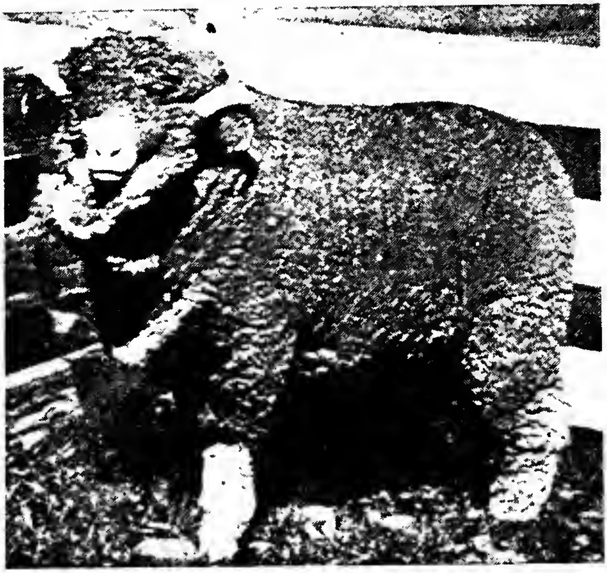
Sir Thomas (known as Old Sir Thomas) was the most notable Merino of his time. He was lambed in 1868, as stated, and the best fleece he cut for 12 months' growth was 12 lbs. He was sold for 680 guineas, at that time the highest price ever paid for a Merino ram.



Old Sir Thomas.

Lambed 1868 ; sold 1874, for 680 gns. ; cut 12 lbs.

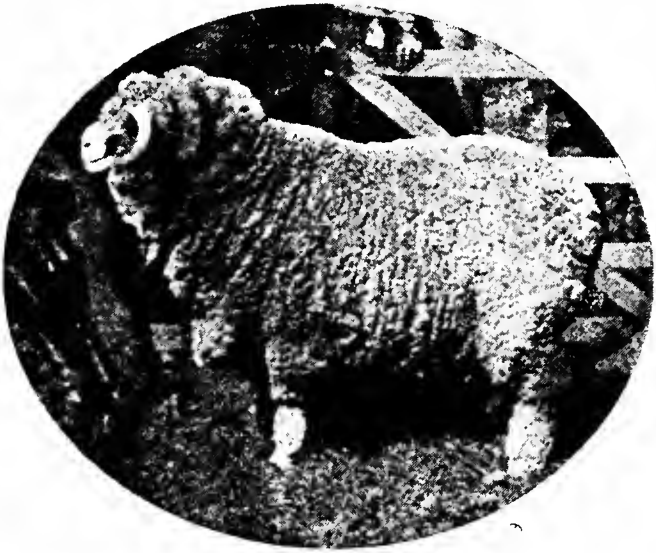
The photo shows him to be a very plain type of sheep, with no neck, arms and thighs as are known even at the present day. However, he was a crack sheep of his time, and Mr. Gibson used him heavily in his flock. He sired, amongst other notable rams, Sir Thomas II., who was lambed in 1872. It is important to note that this ram cut 14 lbs. of wool as against Old Sir Thomas' 12 lbs. It is also important to note that with this increase of 2 lbs. in weight came indications of folds on neck and front. The folds were small, but still they were there. Sir Thomas II. was sold in 1880 for 604 guineas. In his turn, he got Golden Tom, who was lambed in 1878, and here we notice the weight of fleece has gone up to 17 lbs. A glance at the picture of Golden Tom also shows that with the increase of weight of fleece, the neck folds and front are even more strikingly developed. He was sold in 1882 for 500 guineas. The next two rams in the line were unfortunately never photographed, but the steady increase in weight of fleece still went on. Treasurer was by Golden Tom, and was lambed in 1880. He cut 18 lbs. of wool, and was sold in 1883 for 300 guineas. Golden Horn was by Treasurer, and his weight of fleece was 20 lbs.; he got Golden Horn II., who cut 26 lbs. of wool. Thus in less than 20 years Mr. Gibson had raised the weight of fleece from 12 lbs. to 26 lbs., and by the time Golden Horn II. was reached, it will be noticed that quite a different type of Merino had been evolved. The folds on neck and head had become very pronounced. Quite



SIR THOMAS II.

Lambed 1872; sold 1880 for 604 gns.; cut 14 lbs.

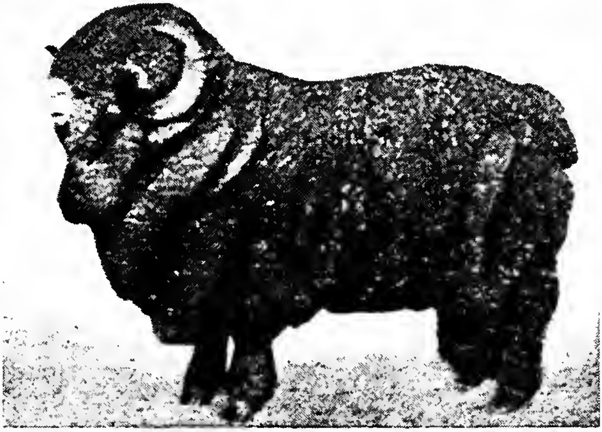
a big front had been developed, and small folds had come behind the shoulder.



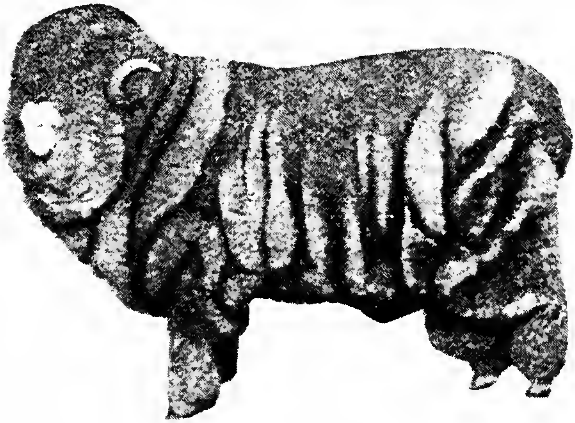
Golden Tom.
Lambed 1878; sold 1882 for 500 gns.; cut 17 lbs.

Golden Horn II.
Cut 26 lbs.

Golden Horn II. was destined to sire President, one of the most famous Merino rams ever known to Australia. He was lambed in 1890, and though he only cut 23 lbs. of wool, he had it most

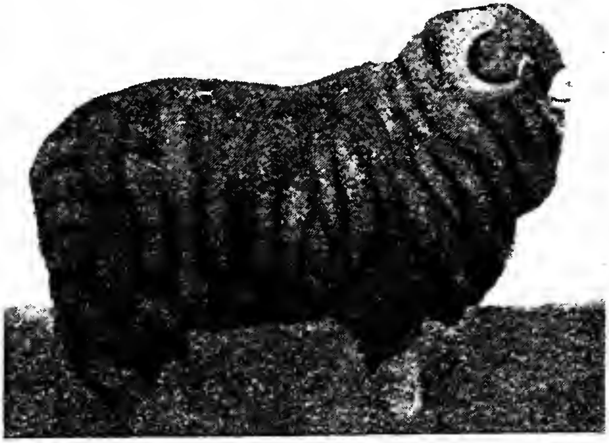


PRESIDENT.
Lambed 1890 ; sold 1896 for 1600 gns. ; cut 23 lbs.



PRESIDENT II.
Lambed 1895 ; cut 27 lbs.

beautifully put on. His general symmetry and bearing were so perfect and his fleece so evenly put on that President became a household word amongst sheep-men all over Australia, and he sold in 1896 for 1600 guineas, till then the highest price ever paid for a Merino ram. A glance at his photo will show how bold the neck folds and front had become. The progress still went on, and President amongst the host of great rams he sired, got President II. in 1895. This ram was never sold, but it will be seen that the folds were very much more pronounced than on any of the preceding rams, and he topped them all, as regards weight of fleece, as he cut 27 lbs. In 1898 he got President III., who cut 30 lbs. of wool and sired Patron, a ram which reached the zenith in the line as far as weight of fleece is concerned. He cut 36¾ lbs., and behold his body is covered with heavy folds, and his front and thighs are likewise. He is a very different looking sheep to his great progenitor, Sir Thomas, and was sold in 1907 for 1000 guineas. He sired Patron II. (see next page), lambed in 1906, and sold in 1910 for 800 guineas. His weight of fleece was 31 lbs. Since then, with the change of fashion, these sheep have gradually gone back to the plain body, but retaining good bold fronts. Moreover, although the wrinkles are gone, the density remains, and the best Tasmanians are models of how wool should be packed on to the Merino frame.



PATRON.
Lambed 1900; sold 1907 for 1000 gns.; cut 36¾ lbs.

Overshot jaw in Merinos is a defect that occasionally crops up in sheep, and no breeder should run the risk of using a ram so affected among ordinary flock sheep that have to get a living on natural grasses, nor should such a sheep be used in the stud. Both wool and mutton depend entirely upon what the sheep is able to eat, and any malformation that impairs his means of subsisting must be condemned. Of course, no sheep is really perfect, and faults and defects have relative degrees. Many a good ram has, say, a slight tendency to be uneven in his fleece, but he would not be such a risky ram to use as one that was very uneven. In the same way a ram with a slightly overshot jaw would not be so objectionable as a ram that showed the defect in a very marked degree. Then, again, this malformation may appear as a freak in a ram descended from a long line of ancestors absolutely free from it, in which case the chance of him passing the defect on to his progeny would not be as great as if it was of frequent occurrence amongst the family from which the ram descended. So the wisdom of using a ram with an overshot jaw would be largely determined by knowing all about the sheep in question.

Patron II.
Lambed 1906 ; sold 1910 for 800 gns. ; cut 31 lbs.
(For letterpress see previous page.)

Before closing this chapter on Merinos, a brief reference may be made to one of nature's vagaries, viz., black sheep. Every Merino flock will frequently have dark brown or black individuals cropping up, and although there is nothing actually to be said against the sheep themselves, they are rather a nuisance at shearing time if in any considerable numbers. It is generally considered that the appearance of black sheep is due to reversion to some far ancestry, and white sheep showing any brown or black spots are always liable to get black stock. A few breeders in Australia have devoted their energies towards the building up of a purely black Merino flock, one of the earliest instances of this being one established in Queensland in 1877-78 by Mr. William Allan, at Braeside, Dalveen, on the Darling Downs. Mr Allan had for many years been managing and breeding Merino sheep in New South Wales and Queensland. During that period he noticed that the purer the stock were, it seemed to him, the more often black sheep appeared among them, notwithstanding that every sheep having any coloured spot about it was rigidly excluded from the stud flocks. It therefore occurred to him, the strain proving so strong, and apparently impossible to obliterate, that probably the original Merino sheep had been principally black, and by continuous culling for centuries had been brought to the present prevailing colour. He determined, therefore, to try if by putting black sires to black ewes, these would reproduce in any quantity the like colour. To his surprise he found that in every case it succeeded, and no white lambs resulted. The flock was carefully culled and the results more than realised Mr. Allan's most sanguine anticipations. In picking sheep for the coloured flock he made it a *sine qua non* that the tongue and roof of the mouth were black, and in his opinion, the black sheep were hardier and more active than the white Merino, while they suffered less in drought or bad seasons.

A Black Fleece with Two White Fleeces.

The wool of Mr. Allan's flock was noted for its character and quality, and at the London sales in 1885 the fleece wool all round in grease brought 18½d. per lb., or very considerably more than the average at the same sales of white Merino wool in the grease. The cloth manufactured from this wool is of a fine dark coffee colour, and it can be rendered any lighter shade, of course, by an admixture of white wool. Such a cloth has its advantages, for when properly bleached before finishing, it does not fade. Nearly all dyes contain matter which has a destructive influence on the fibre of the wool, so that this cloth, being free from dye, lasts much longer, besides keeping its colour. Braeside, where Mr. Allan's flock ran, is granite and slate country, 2800 feet above the sea level, and about 100 miles from the coast, but it has long since been dispersed. Another and more modern black Merino flock was one run by the late Mr. R. P. Abbott, at Barsham, near Blandford, in New South Wales.

It has since been sold and dispersed, but in any case a few years ago Mr. Abbott was running some 3000 pure black sheep, showing great uniformity, due to years of careful culling and mating. All piebald sheep were taken out and the remainder culled by their mouths, the latter being a very important point in connection with breeding black Merinos. In order to get uniformity of colour it has been found absolutely necessary to cull out the sheep which show any white on the tongue or palate, or anywhere in the mouth. It can be understood that it is slow work improving a flock of black

A Black Stud Ram.

Merinos, owing to the strict limitations imposed on the choice of sires, and during the first few years that the Barsham flock was in existence, there was hardly a sound-fleeced sheep in the lot. However, by patience, heavy culling and careful selection of sires, there was a great advance and tender wool was absolutely eliminated, attractive fleeces being produced, showing marked evenness of length, character and colour, with much of the clip over 70's quality. We have no late figures regarding the flock, but the following are somewhat interesting. In 1911, the whole clip of white wool produced on Barsham averaged 10.46d. per lb., whereas the black clip averaged 10.58d. per lb. In matter of weights the black sheep also more than held their own. The white sheep all round cut 7 lbs., and the black sheep 7 lbs. 2 oz. The lambing figures are given as generally running from 75 to 80 per cent. marked. It is a very unique sight to see a mob of black ewes coming up to the shed in full wool. The majority of them have a white patch on the head, and have a brownish or rusty tip. When they are shorn, however, they go out jet black, and the fleeces, rolled with the tip in, also look jet black.

It may be said in regard to the above, that black wool, as compared with white wool, has no particular basis of value, the demand being intermittent, and mostly on account of specialities for which there is nowadays little demand. An enquiry for undyed wool may lead to a temporary demand for mixing purposes, and to that extent a small quantity—particularly if really black, and not grey or parti-black—is marketable, but there does not appear to be any inducement to grow it as a commercial proposition.

Black sheep fatten as well as white, and also kill as well, the fat being evenly spread over the carcase, but they are not such good travellers. They appear to fret when away from the pastures to which they have become accustomed. Another interesting point about them is that they will not mix for long with white sheep. If two mobs are boxed, and turned out into the paddock, it will not be very long before the blacks go one way and the whites another.

CHAPTER VIII.

THE BREEDS OF SHEEP (*continued*).

BRITISH BREEDS.

Romney Marsh—Lincoln—English Leicester—Border Leicester.

We have now to consider the various British breeds of sheep, which are to meat production what the Merino is to the wool-growing industry. They furnish a very large percentage of the sheep stocks of Australia and New Zealand, their chief use being for fat lamb and mutton production both as pure breds and crossed with some other breeds, either Merino or another British breed.

We will proceed to deal with each individually, taking first the Romney Marsh. The typical sheep of this breed is thus described in the Flock Book of the Australian Longwool Sheep-breeders' Association :—Wide head, level between the ears, with a good thick foretop ; no horns, or dark hair on the poll, which should be covered with wool. Eyes should be large, bright and prominent. Face in ewes full, and in rams broad and masculine in appearance. Nose in all cases must be coal black. The neck should be well set in at the shoulders and strong and thick. Shoulders wide, well put in and level with the back. Chest wide and deep. Back wide, long, rump well turned. Tail set in almost level with the chine. Thighs well let down and developed. Legs should be short, with big bone and large shapely feet of black horn. The fleece should be of dense, even quality, and of a good decided staple from foretop on head to end of tail.

It owes its hardiness to the improvement of the breed having been accomplished much more through selection of the best within the breed itself than by crossing with the improved Dishley Leicester, and to the natural method of management, which permitted the breeding ewe flocks to find their own food on unsheltered pastures in place of being hand-fed and pampered like other low country sheep.

The mutton is good, but as already stated, the Romney's great characteristic is its hardiness, which permits it to thrive and give a profitable return where Lincolns or Leicesters will not succeed at all, as it has remarkable resisting capabilities against fluke, footrot and other diseases developed in low-lying country. It is therefore a very good sheep for wet districts. In this connection, it is interesting to quote from a letter that appeared in "The Pastoral Review" many years ago, in which the writer said :—" In a letter signed 'Old Weranga,' in your July number, the assertion is made that 'the Romney Marsh sheep, and, indeed, all Longwools, are more susceptible to fluke than the Australian Merino' 'Old Weranga's' experience is very different to mine, and as far as the Romney is concerned, I must say he is decidedly in the wrong. On parts of our district at the head of the Murrumbidgee, where it has been next door to impossible to keep Merinos for more than two years (and in a great many instances they have shown the rot long before that period), the Romney has been kept to my knowledge for seven years, and both the pure-breds and half-breds bred on this unsound country not only thrive well but fatten, and have

A TYPICAL ROMNEY MARSH RAM.

made it possible for graziers to keep sheep, where, owing to the losses through fluke, the Merino had been given up and cattle put on the holdings.

"The writer, for experiment sake, enclosed a few acres of black swamp and regular hotbed of fluke and worms. Six pure-bred Romney ewes, two years old, and six Merino wethers of the same age—both lots bred on the place—were depastured on this enclosure of about 20 acres. They could not keep the feed down, and it grew rank and strong, making the conditions very favourable for disease of all kinds. The Romneys got as fat as you could make them, and cut a wonderful fleece of wool. Two of the Merinos died during the winter when about half of the enclosure was under water. The other four were as fine a specimen of rotten sheep as one could possibly see, with a miserable fleece. They were killed as useless and their livers were covered with hydatid cysts and full of fluke. Two of the Romneys were killed, and were splendid carcases of mutton. They both had some fluke, but nothing to hurt. The other four are now five years old, and seem none the worse for their twelve months on the swamp. This experiment has satisfied the writer that although no sheep can be said to stand sound against attacks of fluke (or rot) under favourable conditions for the development of this disease, the Romney Marsh sheep will be the last to succumb, and is the most likely to withstand it."

From time to time there has been a good deal of controversy as to whether it is imperative that the Romney should have black feet. Breeders differ on the subject, but it can be taken that light coloured feet are a point that would detract from a perfect sheep. Strangely enough in Vol. XII. of the Flock Book of the Kent or Romney Marsh Association of England, no reference is made to the feet in describing the breed. In subsequent volumes of the same Flock Book, however, the typical Romney is described as having "feet large and black." Also in the New Zealand Romney Marsh Association's Flock Book, Vol. VI., he is described as having "large shapely feet of black horn."

Of course it is a moot point whether the sheep is really any the worse for having light-coloured feet—not white ones, which would denote weak constitution—but there is the standard as set up by the leading Associations connected with the breed, and if the specifications are to be ignored in one respect, the whole lot fail to carry the weight they should. A leading New Zealand breeder sums up the position pretty accurately:—"We attach considerable importance to black feet and endeavour to breed them black. We would certainly give preference to the sheep with black feet at a show, but would not disqualify a sheep for having light-coloured feet if he was pre-eminently the best in his class in every other respect. We have seen some breeders and judges paying undue stress to some particular point, and neglecting the general utility points and characteristics instead of giving due attention to every characteristic, invariably with unsatisfactory results. It is uncommon to see a well-bred Romney with white feet, they are in some cases not absolutely black, but rarely altogether white."

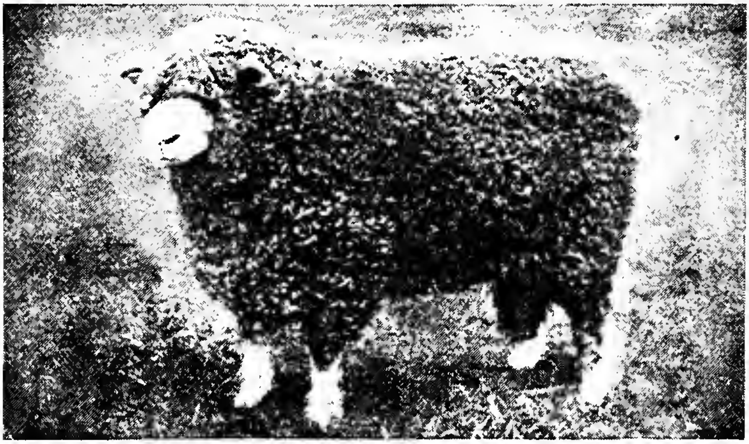
THE LINCOLN

The Lincoln is deserving of a front rank position among the English breeds that can be termed general utility sheep. Naturally, climate and pasturage are the chief determining factors in deciding what breed should be kept, but when all is said and done the Lincoln is an animal that is worth favourable consideration. It is the largest of any of the mutton breeds, and is also the producer of the heaviest fleece. Its disadvantages are that it is not a good traveller or a "fossicker" when food is not superabundant, while it is more prone to footrot and worms than the hardier Border Leicester or Romney Marsh. But every sheep to his own country, which is only a repetition of one of the first principles of sheep farming—a rule that has already been quoted—that in choosing a breed one of the first matters to be decided must be that the sheep shall be likely to suit the country on which it is intended to place them, and moreover that they shall be likely to adapt themselves to the climate of that country. The points of a Lincoln are set out as follows in the Flock Book of the Australian Longwool Sheepbreeders' Association :—

A typical Lincoln ram is a big sheep with a handsome, masculine head, large ears marked with blue spots, head well covered with wool, wide sprung ribs and shoulders, with a back of thick firm-handling flesh. He must have a good leg and neck of mutton, and must stand wide and square on his legs and have plenty of bone. His fleece must be very weighty, of fine quality curly lustrous wool, and the wool all over must be of the same description. The belly, breast and hocks must be completely covered, and it is important that the wool on the thighs be fine and curly, and not straight and coarse. The ram should have his shoulders set well back, and have a free, gay carriage.

The Lincoln and Merino cross produces a very superior, stylish, good-spinning half-bred wool, and on account of the density and length of the Lincoln, also a good heavy fleece. In Lincoln wool we have the brightest and most lustrous raw material of all wool, and probably there is no factor which has helped to make Lincoln wool so popular as the wealth of fleece, combined with the lustre of the staple.

In spite of the quality of the mutton being only second rate, the unequalled power of wool production and large size of carcase have brought the breed into high repute, and it is mated most successfully, as already stated, with the Merino to form a good general purpose sheep for both wool and mutton, a cross which lies at the foundation of the Corriedale, a breed that will be fully discussed in another chapter. While on the subject of the Lincoln carcase, it may be mentioned that for many years in Australia there has been a tendency to go "all-in" for wool, a tendency that has led to a weakening of the frame, with consequent detriment to the constitution. This is obviously bad policy, and it is to be regretted that so many Lincoln rams, good in the wool, but with narrow backs and mean frames, are allowed to perpetuate those faults. However, breeders are beginning to realise the mistake, and we now see more sheep of the right type approaching the English standard, in which constitution has not been sacrificed for wool. New Zealand Lincolns are very good carcased sheep, and at the same time carry a nice lustrous fleece of good quality.



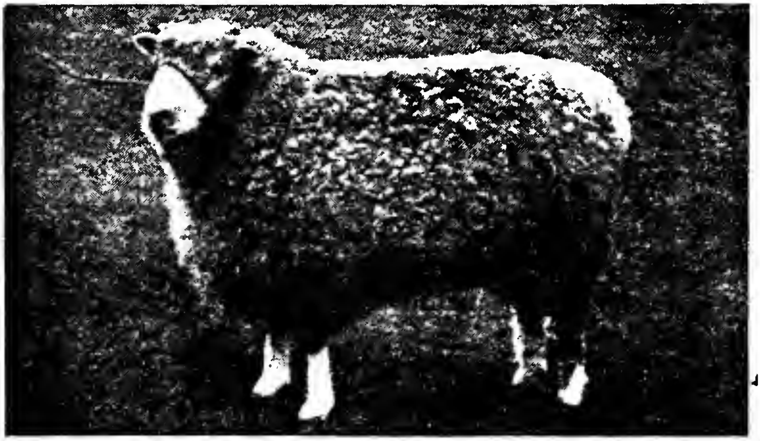
A TYPICAL LINCOLN RAM.

THE LEICESTERS.

Under this heading we have to deal with two allied breeds, the Border Leicester and the English Leicester. The latter was the first British breed improved by in-and-in breeding and selection. Bakewell, at Dishley, in Leicestershire, began the system about 1755, and the success of his efforts was secured by the simultaneous extension of the cultivation of the turnip as a field crop. A liberal supply of winter food was made available, and the old ungainly slow-maturity Leicester, which had been bred merely for size and a heavy fleece, was transformed into a compact, symmetrical, moderate-sized animal, possessing great aptitude to fatten, and above all a marvellous power of communicating its tendency to early maturity and its refining influence to breeds with which it was crossed. Bakewell aimed at producing a valuable carcase, and the fleece was a secondary consideration. Marvellous results were got by his methods and his matchless instinctive skill in mating his animals. He originated the practice of letting out rams for the season in place of selling them. This gave him a large number of sheep to select from in pairing different types. It took 20 years before his neighbours were sufficiently convinced of the soundness of his system to pay a 10-guinea fee for the hire of some of his choicest rams. Four or five years later the fee rose to 100 guineas, and in 1786 he let two-thirds of the service of a ram for 200 guineas, and received in all 1000 guineas for hires. So quickly did the merits of his sheep grow in public favour that "in 1789 he made 1200 guineas by three rams, 2000 guineas by seven others, and 3000 guineas for the remainder. His highest rate was 800 guineas from two breeders for two-thirds of the season's services of his favourite 'Two-pounder.'"

The Dishley Society was formed in 1790 for the preservation of the purity of the Leicester, and by means of rules of extraordinary stringency an attempt was made to create a sort of monopoly in the interests of Bakewell and a few friends. The only unselfish condition of interest was that "no member should give his rams at any season of the year any other food than green vegetables, hay and straw." Such fame did the Dishley Leicesters gain, that "within little more than half a century they spread over every part of the United Kingdom," and by 1837 there were "few flocks of Longwool sheep in England, Scotland or Ireland, which were not in some degree descended from Bakewell's flock. No other sort of sheep possessed so great a propensity to fatten or become fit for the butcher at so early an age, but they could not travel far for their food, nor could they bear so well as many others occasional scantiness or deprivation of nourishment." This holds good to-day with improved breeds. Early maturity is secured at the sacrifice of the robust constitution which enables unimproved breeds to fight for their existence. Other drawbacks besides delicacy of constitution were "shortness and lightness of fleece, and the scarcity of doubles, owing to discarding the ewes that bore twins to get large single lambs when they were high-priced." The great value of the breed consisted in the improvement effected in almost every variety of sheep that it crossed. The defect in the fleece has been largely got rid of in the modern sheep, and the quality of the mutton, which was somewhat insipid and not in high favour, has been improved.

The English Leicester ram of to-day should have a square or rectangular carcase, with legs well set on, straight hocks, good pasterns and neat feet. The nose should be slightly narrow and Roman, but the general form of the face should be wedge-shaped and covered with short white hairs. The lips and nostrils should be black, forehead covered with wool, and no vestige of horns. The ears should be long, thin, and mobile. A black speck on face and ears is not uncommon. He should have a good eye, short neck level with the back, thick and tapering from skull to shoulders and chest. The breast should be deep, wide, and prominent; shoulders somewhat upright and wide over the tops; great thickness from blade to blade, or through the heart. He should be well filled up



A Typical English Leicester Ram.

behind the shoulders, giving a great girth, and should have well-sprung ribs, wide loins, level hips, straight and long quarters, tail well set on, good legs of mutton, great depth of carcase, and fine bone. He should have a curly lustrous fleece, even all over, and free from black hairs. The flesh should be firm and the skin of a pink, healthy colour.

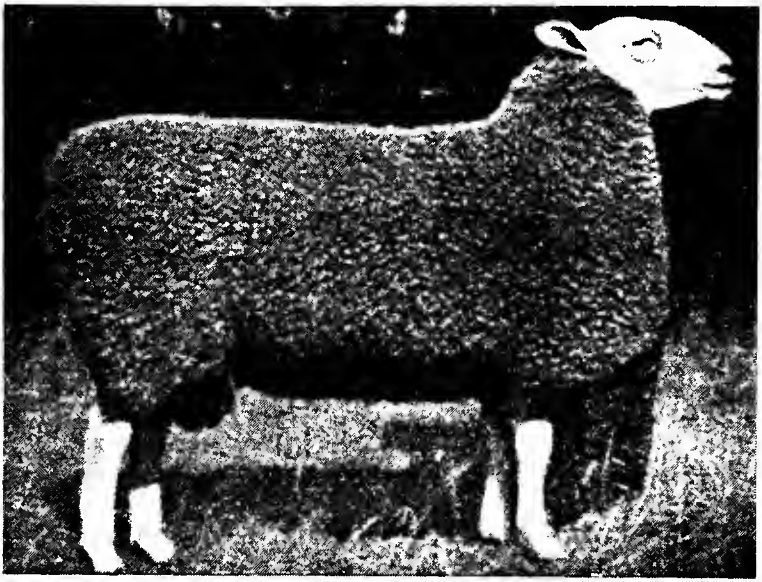
The English Leicester runs the Lincoln close for its even breeding. Not only are the Leicesters a well-constitutioned class of sheep, but good breeders, and they have frequently been known to produce fleeces of clean-washed wool weighing from 21 up to 28 lbs., with a fibre of beautiful texture. It is almost equally lustrous with the Lincoln under certain conditions of climate and feed, but of a finer spinning quality.

There is some little difference of opinion regarding the origin of the Border Leicester, some authorities maintaining that the Cheviot was crossed with the pure Dishley Leicester, while others hold that no such crossing took place. However, it is known that in 1767, George and Matthew Culley, both pupils of Bakewell, took a flock of Dishley Leicesters with them to the North of England. They were followed soon afterwards by Robert Thompson, another of Bakewell's pupils, who also established a Dishley flock. Others naturally followed their example as the merits of the sheep became known, and while some writers state that the Cheviot was used to some extent, we have the views of John Wood, of Haddington, to the contrary. He argued from the fact that as in 1798 Robertson, of Lady Kirk, gave 400 guineas for a Border Leicester ram, and other breeders gave high prices, the sheep could not have been "crossbred." In answer, also, to the argument that the Border Leicesters must have got their pure white faces and legs from the Cheviots, Mr. Wood contended that "in all old books Bakewell's Leicesters are described as having white faces and legs," while it is known that "a large proportion of Cheviots, about forty or fifty years ago, had brown-grey faces and legs."

Whichever view is correct, however, the Border Leicester has long ranked as a pure breed, and one of the best and most popular of British Longwools. It is extensively used for crossing with other British breeds and the Merino, but this characteristic will be fully dealt with in a later chapter on crossbreeding.

The Border Leicester standard as laid down in the Australian Longwool Sheepbreeders' Association's Flock Book, is as follows:—
The typical Border Leicester is conspicuous for his fine carriage and noble appearance. His head is carried well up, is long and broad between the eyes, but not high on the crown, nor too heavy behind the ears. The profile is slightly aquiline, tapering towards the

muzzle, which is large, open, and black, with wide nostrils. The hair on the face and legs should be uniformly white and hard, and on the head it should extend back well behind the ears, free from any trace of wool. The ears should not be too large nor drooping, but they should be white inside and out. Black spots sometimes appear with age. The back should be straight and level, and the ribs well-sprung in a fine circular arch, more noted for width than for depth. The belly should be light, said to carry little offal, giving a leggy appearance when the sheep is shorn. The Border Leicester wool is long and soft and in little locks, and it should "fill the hand."



A Typical Border Leicester Ram.

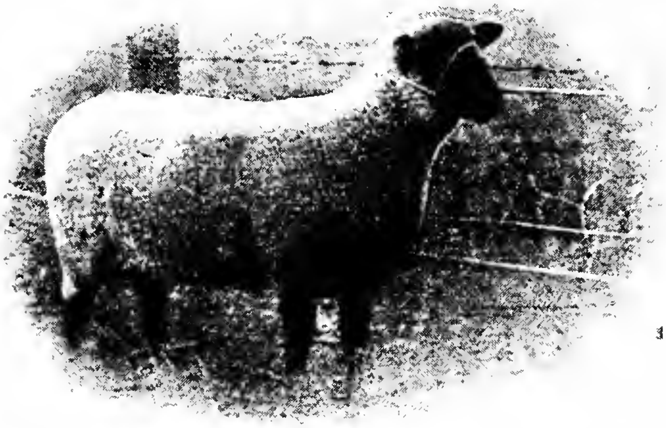
CHAPTER IX.

THE BREEDS OF SHEEP (*continued*).

BRITISH BREEDS AND CORRIEDALES.

Suffolk—Southdown—Shropshire—Hampshire Down—Dorset Horn—Ryeland—Oxford Down—Cheviot—Corriedale—Angora Goat.

There are a number of British breeds that have not yet been touched on, mainly of short wool type, and some of them having a considerable measure of popularity in sheep-raising countries for fat mutton and lamb production. One of the most important, although it has not made the progress in Australia and New Zealand that might have been expected in view of its good qualities, is the Suffolk, a breed that was formed over 100 years ago by



A TYPICAL YOUNG SUFFOLK RAM.

crossing ewes of the Black-face Norfolk Horned Mountain breed with Southdown rams. Passing to the present time, the sheep, as they now exist, may be briefly described as black-faced and hornless, with clean black legs, closely resembling the Southdown in character and wool, but about 30 per cent. larger and proportionately longer on the leg. The distinguishing points of the breed adopted by the Suffolk Sheep Society are as follows :—

Head, hornless ; face black and long, and muzzle moderately fine—especially in ewes (a small quantity of clean, white wool on the forehead not objected to). Ears, a medium length, black, and of fine texture. Eyes, bright and full. Neck, moderate length, and well set (in rams stronger, with a good crest). Legs and feet, straight and black, with fine and flat bone ; woolled to knees and to hocks, clean below. Forelegs set well apart. Hind legs well filled with mutton. Belly (also scrotum of ram) well covered with wool. Fleece, moderately short, close, fine fibre, without tendency to mat or felt together, and well defined, *i.e.*, white, not shading off into dark wool or hair. (The new born lamb has a uniform grimy colour all over the tips of the wool, not patchy like the lambs of the old Norfolk breed, due to patches of black or blue skin growing black wool.) Skin, fine, soft, and coloured pink.

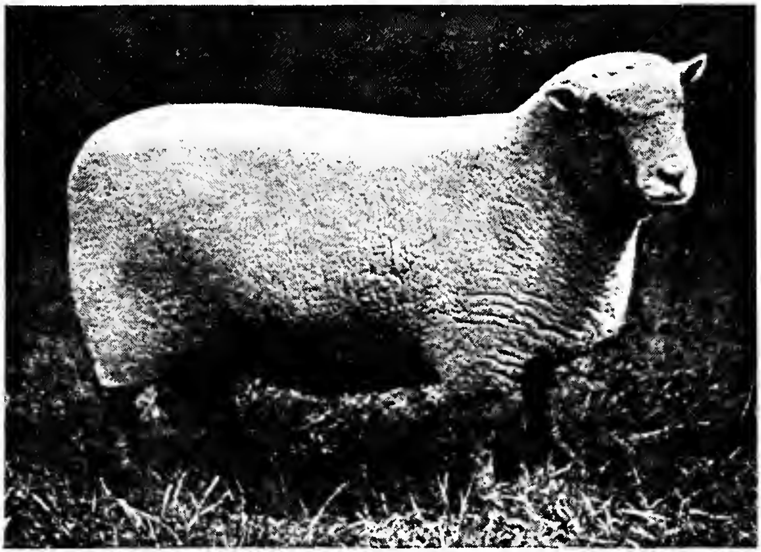
The breed excels in the following particulars :—In activity of movement, good carriage, fecundity, giving very high lambing percentages ; in early maturity, as the ram lambs are so large and well developed that they are usually preferred for breeding purposes to older sheep ; in hardiness, as the breed has not been pampered, and will find a living on bare pastures where most other breeds would starve. The mutton is very fine, possessing an exceptionally large proportion of lean meat. It commands the highest prices in the market. The constitution is unusually robust and hardy, the animals possessing great power of endurance when driven long distances. They are also said to be exempt from foot-rot. The Suffolk ram crosses admirably with all white-faced ewes, producing a black and white speckle-faced lamb, and a carcase full of lean meat, very well suited to the requirements of the butcher.

If well grazed, Suffolk lambs are fit for the butcher from six months old, and at the age of 8 to 10 months will yield 80 lbs. to 90 lbs. of lean dressed carcase. Suffolks are particularly hardy ; they are good " rustlers," and their robust constitution and power of endurance render them eminently suitable for those countries where a long range must be traversed daily in search of food.

The strength of the constitution, activity, and prepotency of the Suffolk ram renders him a most successful mate with many other breeds. Above all, Suffolk blood improves the carcase of long-woolled breeds by increasing the proportion of lean meat. The cross so obtained is not only an animal yielding a heavy fleece of good wool, but also a very superior carcase. A flock of mongrel ewes and their produce crossed through several generations by Suffolk rams get type, fecundity, and good milking qualities. The valuable characteristics of the breed should bring it into wider use, at least in Australia and New Zealand, than it is to-day.

THE SOUTHDOWN.

The Southdown is the breed which was employed to refine all the other Down breeds in the same way as the English Leicester was employed to improve the Longwood breeds. According to Robert Wallace, professor of agriculture and rural economy at Edinburgh University, the present refined and symmetrical animal has been developed by selection from the original stock, which was leggy and ill-proportioned. No outside blood was introduced, although Bakewell urged the use of the Leicester ram.



A TYPICAL SOUTHDOWN RAM.

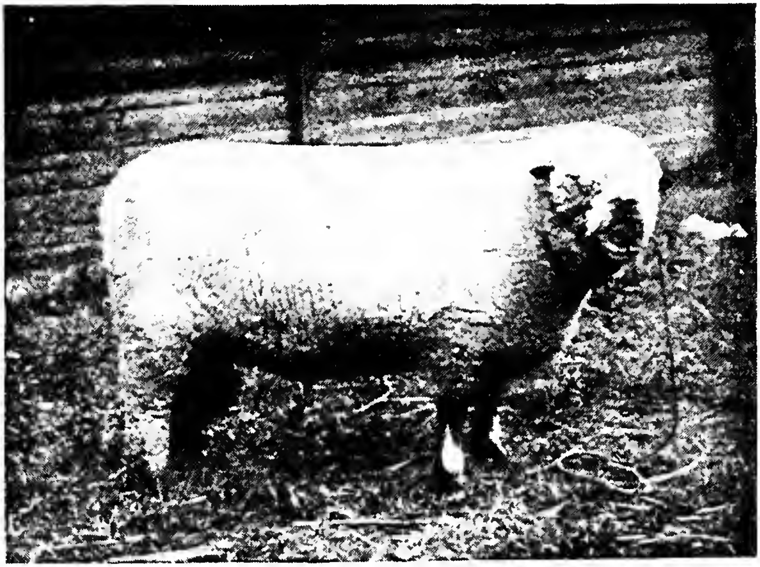
The Southdown of to-day has a small neat head, woolled up to the ears and on the forehead—naked ears being most objectionable. Grey-brown is the uniform colour of the short hair on the face and legs, though it was once speckled. The fleece is short, close, thick and of fine quality, weighing 3 or 4 lbs. per ewe. Any darkness or dulness of the wool when parted is an objection.

No breed surpasses the Southdown for rapidity of feeding and early maturity. Lambs dropped early in January are frequently sold fat in April. The mutton is of excellent quality, but it can easily be fed too fat. Before early maturity became the rage, wethers rising two years old could be got to dress to 138 lbs. per carcase or 34½ lbs. per quarter, and to yield 65.8 per cent. of their live weight. Southdowns are good doers and good travellers, and when it comes to getting to the slaughtering works over considerable distances, sometimes under adverse conditions as to feed and water, without undue wastage of weight and bloom, the pure Southdown and the Southdown first cross will give a good account of themselves. Its centuries of acquired hardiness on the cold, bleak downs of East England, swept by the blasts and fierce gales of the North Sea, and its natural activity of movement, undoubtedly contribute to make the Southdown a good traveller and a good doer, withstanding equally well drought and bleak, cold, wet times.

THE SHROPSHIRE.

The Shropshire is a medium-sized sheep, and possesses at any age a thick uniform cover of flesh on the back and ribs when handled for the butcher. It is noted for its hardiness of constitution and tendency to early maturity; also its wonderful adaptability to many different soils and climates. It can be crossed with success with sheep of almost any pure breed, and with the common mongrels which constitute a large proportion of the sheep flocks of the world. It has a fairly heavy fleece of good bright wool; and a superior quality of mutton, indicated by the darkness of the hair on the face and legs.

The Shropshire Sheepbreeders' Association Flock Book Society was formed in 1882. A Shropshire ram should possess a well-developed head, with clear and striking expression of countenance; a muscular neck, well set on good shoulders; the body symmetrical and deep, placed as squarely as possible on short legs, due regard being paid to grandeur of style; a well-covered head; and wool of the best staple, rejecting as much as possible all animals showing an inclination to produce black wool or dark skins; the skin should be a nice cherry colour, and the face and legs a nice soft black, not sooty, nor a rusty brown, and free from all white specks; the belly also should be well-woolled, and all inclination for the wool to peel



From "Farm Livestock in Great Britain."

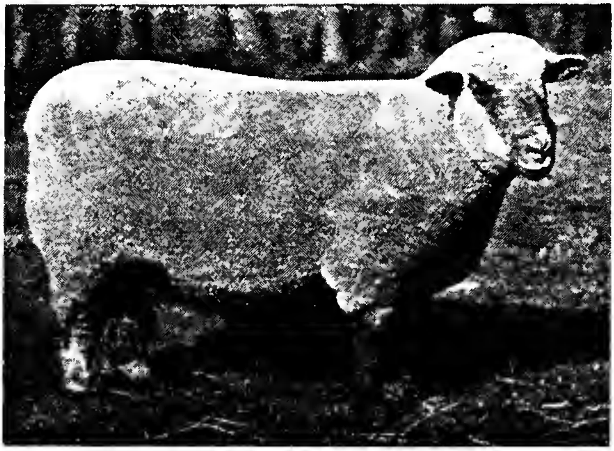
A Shropshire Shearling Ram.

at the jaw and legs should be avoided; good bone, and legs so placed as to support the frame with ease (*i.e.*, widely placed) are also essential points.

The Hampshire Down.

A brief reference only need be made to some of the less known and less important of the British breeds, of which the above-named is one. The Hampshire is a larger, lower set, more substantial, stronger boned and coarser-looking sheep than the Shropshire, and when young it is not easily fed fat to the touch, although often forced to great weight by heavily feeding the ewes until the lambs begin to eat.

The head should be large but not coarse, free from dwarfed horns and with a strong Roman nose; the face and legs a uniform dark brown or almost black, a light face indicating a recent Southdown cross. The average weight of fleece is 4½ to 5 lbs. for ewes; the wool should be free from black patches and grow close up to and around the ears, dense and fine over the body, white when shed. The ears are a good size, inclined to be thick but not coarse, and more pointed than those of the Southdown; of a dark mouse-colour behind, and free from light specks. The hindquarters are particularly full and well carried out, and the top of the shoulder is exceptionally wide.



A Hampshire Down Ram.

The Dorset Horn

The Dorset Horn is a pink-nosed, white-faced horned breed of considerable merit and popularity in England. The lambs arrive at maturity more quickly than those of Down breeds, and in certain districts Down flocks have been supplanted by the breed, which is noted for its compactness and perfection of symmetry. The head is well carried, and the horns of both rams and ewes have uniform and graceful curves characteristic of the breed, rising wide apart but set low at the crown.

The wool, classed as medium grade, covers the crown and comes close up round the horns and ears and on to the jaws, as in the Merino, and forms a dense tuft on the forehead. The wool is closely set, dense and level on the surface. The wool of the lamb is specially valued for its whiteness and other superior qualities. The special and peculiar feature of the breed is that the ewes come in season very early, and will take the ram again soon after lambing, thus being able occasionally to produce two crops of lambs in a year, although the practice is not one to be recommended for general adoption.

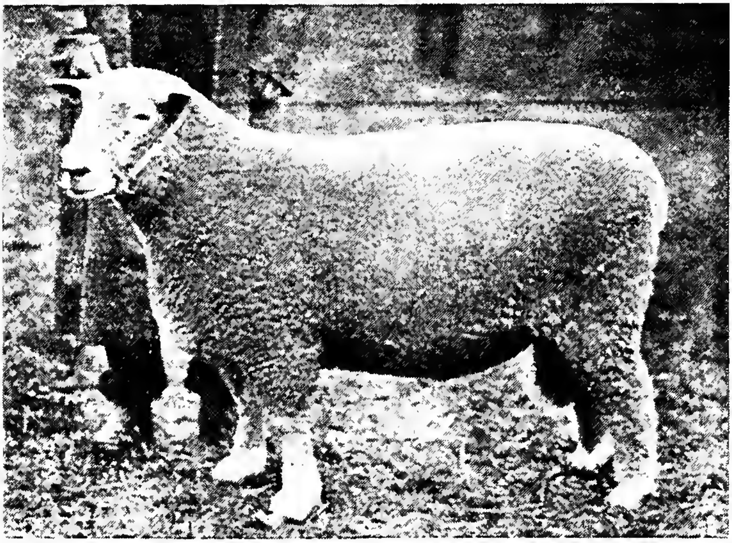
A Dorset Horn Ram.

The Ryeland.

The Ryeland is one of the finest woolled of all British breeds, and strongly resembles the Shropshire in form and appearance.

It was originally a small, but very hardy, white-faced polled breed, with a light fleece of not more than 2 lbs. of wool. Size and wool-producing properties have, however, been introduced into the breed without materially injuring the hardiness of the sheep or the quality of the mutton. It can thrive on tracts of cold, damp soil growing inferior herbage, where other breeds would starve. The wool is of good deep staple, and thickly set on the skin.

The symmetry of the breed is excellent, and the handling especially good at the junction of the neck with the trunk. Good thick durable hoofs are a guarantee against footrot. The white of the face and legs is dull, in place of the "china" white of the Cheviot and Border Leicester. A few Ryeland flocks are to be found in New Zealand.



From "Farm Livestock in Great Britain."

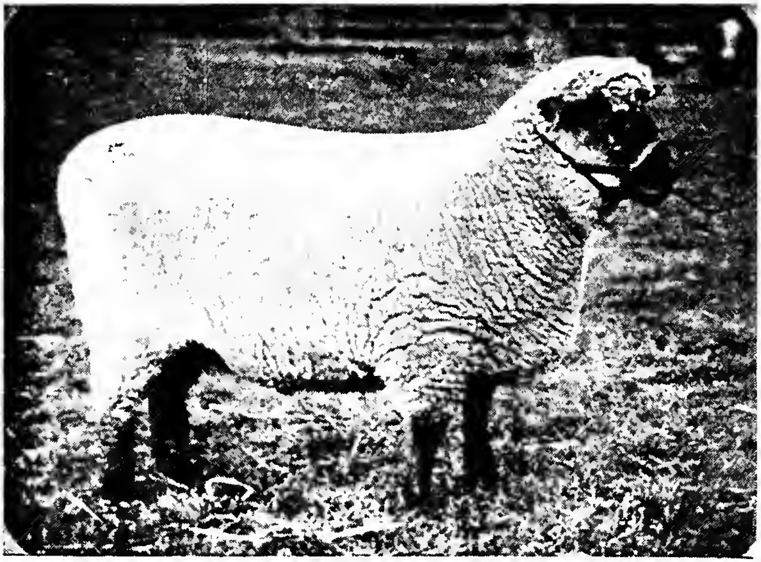
A RYELAND SHEARLING RAM.

THE OXFORD DOWN.

The Oxford Down breed was formed about 1830 by mating improved Hampshire ewes and a few Southdowns with Cotswold rams, the aim being "to secure the superior quality, and therefore a higher price per pound, of the mutton as compared with long-woolled sheep, and the superior weight of wool and of mutton as compared with short-woolled sheep." It was described in 1854 "as the most profitable sheep to the producer, the butcher, and the consumer."

The Oxford Down Sheepbreeders' Association was formed in 1888, and the first issue of the Flock Book appeared in the following year, giving the distinguishing characteristics of the ram.

viz., " a bold masculine head, well set on a strong neck ; the poll well covered with wool and adorned by a top-knot ; the ears self-coloured and of good length ; the face a uniform dark brown ; the legs short, dark-coloured (not spotted) ; the mutton firm, lean, and of excellent quality ; the fleece heavy and thick on the skin. The wool is longer and looser than that of any other Down breed, and ought to be classed as longwool.



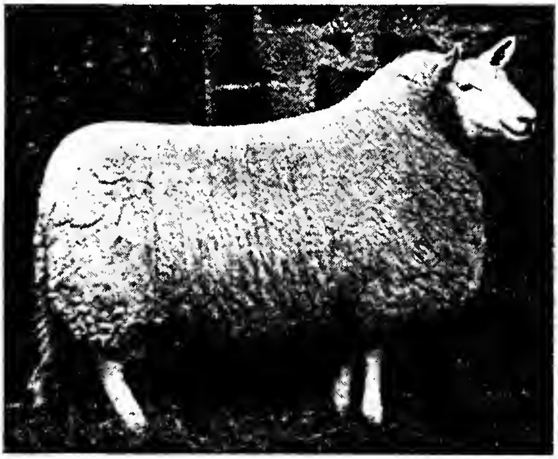
From " Farm Livestock in Great Britain."

An Oxford Down Shearling Ram.

The Cheviot.

Coming to the Cheviot, the name is derived from the rounded green hills on the Scottish and English borders, which are the native home of the breed. The following description of the Cheviot sheep is condensed from the first volume of the Flock Book issued in 1893 by the Cheviot Sheep Society :—

" The Cheviot tup of maturity weighs, when fat, at least 200 lbs. live weight. He should have a lively carriage, bright eyes and plenty of action. His head should be medium in length, well covered with short, fine, white hair ; his ears nicely rounded and not too long (well up from the eye), and rising erect from the head (drooping or low-set ears or narrow ones, 'hare-lugged,' are decidedly faulty); nose arched and broad, and nostrils black, full and wide open; neck strong, but not too long; ribs well sprung and carried well back towards the hook bones (a long weak back being about the worst possible fault); the tail well hung and nicely fringed with wool; the legs broad and flat, covered with short, hard, white hair; the fleece weighing 10 lbs. to 12 lbs. of fairly fine densely-grown wool of equal quality, meeting the hair at the ears and cheeks in a decided ruffle; bareness there, at the throat or near the forearm, near the hocks or below the body, or coarseness about the breech, is a decided blemish. A hill flock of ewes should clip on an average 4½ lbs. each of fine (washed) wool, stiff, straight, dense and not too short. Hard feeding makes it stronger. The Cheviot should live and thrive well on the poorest keep."



A CHEVIOT RAM.

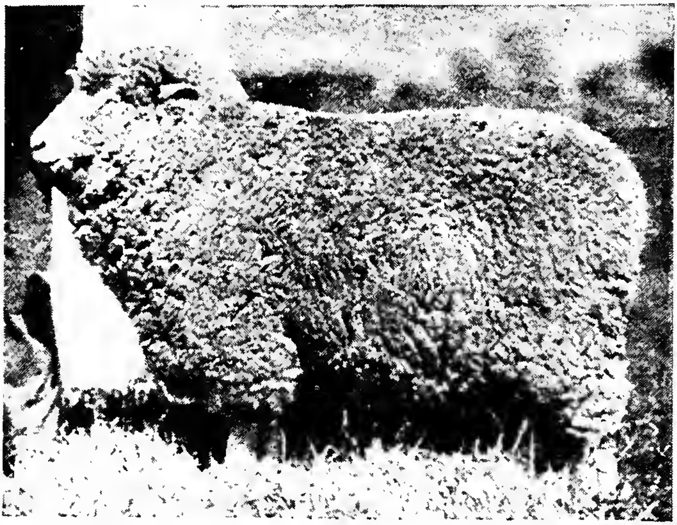
THE CORRIEDALE.

Before concluding these descriptive chapters on the various breeds of sheep, we will touch on one of far more recent origin, viz., the Corriedale, a breed that was founded in New Zealand about half a century ago, and has since spread to Australia, North and South America, Japan and other countries, giving most satisfactory results as a good all-round sheep. It is unfortunate, however, that this useful breed is shrouded in a good deal of misunderstanding, due to ignorance regarding its origin. It is, in reality, the result of an effort to establish the desirable characteristics of the first cross between a Longwool and a Merino, and was the outcome of special requirements in certain parts of New Zealand. This origin has made the Corriedale the subject of a good deal of abuse, but when all is said and done everything must have a beginning, and many of the now popular British breeds of sheep owe their special characteristics to the blending of two or more breeds. It is not intended to disparage the value of pedigree, rather the reverse, for its effect is becoming intensified in the Corriedale with every passing year. Admitting, as many claim it is, that the Border Leicester is of Cheviot-Leicester origin, and in spite of the Leicester infusion in the Lincoln, nobody finds fault with the Lincoln and Border Leicester to-day. Of course, the Longwool, mated with the Merino, is more a fusion of opposites than either of the cases above-mentioned, but the principle is the same, the only difference being that the greater the diversity of types mated in the first place, the longer it will take to establish prepotency and uniformity.

Returning to the question of the actual origin of the Corriedale, a New Zealander, Mr. Jas. Little, claims to have originated a half-bred flock true to type on Corriedale Estate, Otago, when managing that property for the late Dr. Webster some time in the fifties. He made this flock by in-breeding the first cross between Romney Marsh and Merinos, and he ran it for over 20 years, with results considered to be very satisfactory. When Dr. Webster died the estate was sold, and the flock was dispersed. Subsequently Mr. Little secured a property called Allandale, in North Canterbury, where he continued experimenting with an in-bred half-bred class of sheep. In 1879 he put 4000 large-framed high-class Merino ewes to the best Lincoln rams obtainable, and from 100 of the best ram lambs a heavy cull was made, only twenty of the best being retained for service. These were mated with the pick of the half-bred ewes. In 1890 two half-bred Lincoln rams were purchased and introduced. In 1879 Mr. G. D. Greenwood, of Teviotdale, North Canterbury, started a half-bred flock by mating Teviotdale Merinos with Border Leicester rams, culling heavily. Later on first cross Lincoln-Merino rams were introduced, and for over 30 years no fresh blood has been introduced, the custom being to select the best ewes and rams to mate together to form a stud flock for breeding rams for the general flock.

In 1874 an in-bred half-bred flock was founded on the New Zealand and Australian Land Co.'s Levels Estate, 1000 picked

Merino ewes being put to high-class Lincoln rams. The flock produced its own rams until 1892, when an in-bred half-bred Lincoln-Merino ram was purchased and slightly used; another ram was introduced in 1902, but only little used. The flock has produced its own sires ever since. In later years other Corriedale flocks were formed, and eventually the breed was admitted to the New Zealand Flock Book, the regulations governing entry being that the sheep must be the progeny of half-bred rams from half-bred ewes, the result of not less than fifteen years of in-breeding, the original stock being the progeny of Merino and Longwool sheep of any pure breed. Needless to say, all attempts to establish an in-bred half-bred flock did not end successfully, one of the principal causes of failure, apart from lack of breeding skill, being the mating of inferior Merinos with inferior Longwools.



A TYPICAL CORRIEDALE RAM.

The Romney-Merino Corriedale apparently dropped right out at the time the estate of that name was sold, and the Lincoln-Merino strain now largely predominates. The flocks which originated on the Border Leicester-Merino and English Leicester-Merino have been practically inundated with the Lincoln-Merino strain.

As far as utility is concerned the Corriedales give high percentages of lambs, 120 per cent. not being uncommon. The wool ranges from 50's to 60's in quality, and fetches a high price. The best sheep cut over 10 lbs. of wool, and at about 2½ years old will weigh from 90 lbs. to 100 lbs. dressed. The Corriedale therefore combines a good fleece with first-rate carcase characteristics, and it has also acquired a reputation for great hardiness. The progeny in the best flocks show remarkable evenness, but the prospective buyer should be warned about touching anything labelled Corriedale unless there is proof of clear descent on lines that entitle it to that name.

The following may be taken as giving a general idea of the points of Corriedale sheep :—

General Appearance.—The Corriedale should at once give the impression of a heavy sheep of remarkably hardy constitution—the rams of great character and bold outlook. The Corriedale being a dual purpose sheep, in judging equal regard should be given to wool and carcase.

Head.—In comparison with the size of carcase, the head of the Corriedale is on the small side, though that of the ram of masculine appearance—wide open nostrils. A wedged or peaky nose most undesirable ; dark nose preferable, denoting a hardy constitution. Black spots on face or ears allowable, but brown spots on any part of animal is considered a defect. A good top-knot of wool, but clean open face preferred, though not too bare—wool blindness being a drawback.

No horns or sign of horns.

Neck.—Broad and particularly strong, with a good scrag.

Shoulders.—Wide and deep ; great width between the shoulder blades.

Brisket.—Deep and broad, assisting to give the sheep a very square appearance.

Back.—Long, level, and very broad—a wonderful saddle of mutton—ribs deep, and particularly well sprung.

Thighs.—Well apart and deep, giving a wonderfully large and well-shaped leg of mutton.

Legs.—Moderate length and good bone, set straight and well apart. Cow or sickle hocks condemned. Good, hard, well-formed feet, dark in colour preferred.

Wool.—The Corriedale being the great dual purpose sheep, must carry a heavy, even fleece of good length, dense staple, and pronounced crimp or character with an even tip. There must be no body wrinkles. Spinning Quality.—The object quality is a long-stapled, bulky dense 56's, but, of course, climatic conditions largely govern the quality and condition of the fleece. A peculiarity of the pure Corriedale sheep is the remarkable evenness in the length, density and quality of the fleece throughout.

This feature must be rigidly protected—straight-fibred, coarse, hairy wool on any part of the fleece being most undesirable. In the males the purse should be covered with wool, not too coarse or hairy in texture.

Stud Corriedale Rams should cut from 15 to 25 lbs. of wool, according to climate and condition, valuable on account of its length, soundness, character, freedom from fault or excess of yolk—Corriedale wool giving a very high clean scoured yield.

Stud Ewes should cut from 12 to 20 lbs., similar to above, but of slightly finer quality.

Some breeders encourage wool to the toes, and a very woolly head, but wool blindness or a tendency to same must be considered a drawback.

The definition of pure Corriedale sheep (for the purpose of registration) by the Australian Corriedale Breeders' Association is as follows :—

(*a*) The foundation stock to be Lincolns and Merinos.

(*b*) The sheep must be in-bred half-breds for at least 20 years.

(*c*) In the event of a breeder starting his flock with pure Corriedales on one side, it would only be necessary for the progeny from the half-bred Lincoln-Merino ewes to be subsequently in-bred for 15 years.

(*d*) Any breeders whose flocks have been bred up on both sides from Corriedale flocks fully registered in the New Zealand Sheepbreeders' Association's Flock Book, shall be eligible, provided only that such flocks shall have been in-bred for a period of at least 20 years.

ANGORA GOATS.

Although hardly a sheep, a few words about the Angora goat may not be out of place. It has made little progress in Australia and New Zealand, although undoubtedly possessed of many good qualities.

The Angora is a pretty animal. The typical buck shows considerable character in the head, has boldness of carriage, and a pose of ease and dignity. The doe has a neat, expressive head and a graceful body. Speaking generally, the body should be round and broad in its entire length, hips and shoulders of equal height, as low shoulders indicate a delicate constitution; hips not sloping in any pronounced degree, chest broad, legs short. The head should be broad with a wide muzzle, and bright eyes; ears may be partially upright or distinctly pendant. The aim should be to produce an animal weighing at maturity from 60 to 100 lbs. The fleece covers all parts of the body except the inside of the upper legs. It should make an annual growth of not less than from 8 to 10 in., and be so dense upon the animal as to yield from 4 to 6 lbs. The ringlets should be well formed from point to skin, and the tighter these ringlets are twisted the better. Loose, slightly wavy hair is objectionable, and indicates coarseness and brittleness, and often lacks lustre. It is of the utmost importance that the hair should be extremely fine. The ideal Angora is free from kemp, which when present reduces the value of the fleece. The animals reach maturity when 16 or 18 months old, and ought not to be bred before this time. They are prime at from two to six years, and with proper feeding during the winter they have been known to breed regularly until fifteen years old. The average life of the Angora, however, is about twelve years. The period of gestation is about five months, and a great many breeders have had forty or fifty does to one buck with good results.

The better the buck used for crossbreeding the more rapid the progress. If the buck has quality, it is remarkable how he will stamp his progeny. The third and fourth crosses are hardly distinguishable from pure-breds, except to the expert; but the shears and scales tell a different tale. The result in figures has been stated by an Australian writer as follows:—First cross or half-bred, does not pay to shear; second cross or three-quarter-bred, will shear about 1 lb. to 1½ lbs.; third cross or seven-eighths-bred, will shear about 2 lbs. to 3 lbs.; fourth cross or fifteen-sixteenths-bred, will shear about 3½ lbs. to 4 lbs.; fifth cross, or full-blood, will shear about 4 lbs. to 6 lbs. It then becomes a matter of selection and improvement up to a point when a clip of 10 lbs. or even 18 lbs. may be produced. The introduction of the common blood increases the stamina of the progeny, and it is therefore safe to breed with the same buck upon his own daughters. This will increase the rate of progress. With the third generation it will be necessary to change the buck, always endeavouring to have as good quality as possible.

The Angora does do not often drop more than one kid, but with the first cross twins are frequent. With good handling there should be a kid for every doe, and there are instances of 120 per cent. in a flock. The proper time for the kids to arrive is the spring, when there is vegetation about, and warm weather. Just before the kids are due to drop, the does must be separated and placed in small pens. This is advantageous to them, and facilitates handling, as the kids require some attention immediately after birth. A doe knows her own kid by the sense of smell. The kids should not be allowed to go with their mothers until they are from six to eight weeks old. They should not be weaned until 4½ months old. Buck kids not reserved for breeding purposes should be castrated in cool weather when about two weeks old, because the earlier the better for the meat and mohair.

The Angora goat is a clean animal, detesting mud and filth and soiled food. The sheds in which they are accommodated should be well drained and the paddocks defended against dogs and the like. Shelter must be provided. While it is true that the goats are not fastidious, the statement has been absurdly magnified. They require feeding and attention as other stock does, but, of course, in a limited degree. Leaves and twigs of bushes are greedily eaten. They will desert the finest clover and blue grass for such fare, having an appetite for bushes and weeds considered poisonous to other animals. The Angoras are inherent climbers, preferring the hillsides and rocky cliffs. They dislike wet land. In their efforts to get at the leaves and twigs the goats will stand on their hind legs and strip the saplings to a height of 5 or 6 ft. About 200 goats to 40 acres of bush should in two or three years make the land as clean as a garden.

Now a word or two concerning mohair. Its qualities are length, fineness, lustre, strength, elasticity, and specific gravity. The lustre is not due to the oil in the fleece. A mohair fleece may be washed, then scoured, steamed, and dyed and worked up into fabrics after reaching the mills, but none of these processes removes any of the lustre; indeed, all of them operate simply to intensify it. Individual goats of high breeding have shorn from 8 to 12 lbs. of hair, and have carried a fleece of from 12 to 18 in. long.

CHAPTER X.

WOOL.

Qualities or Grades of Wool—Tops—Yolk—"Tender" Wool—Staple—Lustre—Character—Crimp—Density—Grades in a Merino Fleece—Noils—Influence of Frame and Climate on Wool—Examining a Fleece on the Sheep's Back—Kempy Wool—Hogget's Wool—Ram's Wool—Colour in Wool—Crossbred Wools—Corriedale Wool—Longwools—Lamb's Wool—Burry Wools and Carbonising.

There are many valuable and practical works devoted to the extensive subject of wool, and as this book aims more at giving the beginner a helping hand along the road of sheep management than at a technical discussion of the sheep itself or its covering, a brief reference to, or a few pointers regarding wool, will suffice here.

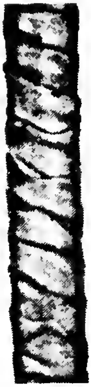
Wool, as the veriest tyro knows, is not all of the one quality or variety. From the coarsest Lincoln to the finest Merino it passes by minute gradations from a "thick" hair-like fibre to one resembling spun silk, and for the purposes of commerce, these gradations are split up and defined by numbers, which serve as standards of the degree of fineness, or "quality," of the wool. The numbers or terms used, from the "32's" of the coarsest Lincoln to the "90's" or over of extra-superfine Merino, are determined by the number of "counts" that can be spun from the class of wool in question. A count measures 560 yards of spun yarn, which is then called a hank. Thus a wool top of 60's quality should spin 60 hanks of 560 yards length from each pound weight of scoured wool, and so on. Consequently, the finer the fibre, the greater the count of hanks to the pound of wool, and the higher the price demanded for the yarn. A top is the name given to wool after it has undergone the process of scouring and combing. The dictionary meaning of the word "tops" is "balls of combed wool from which the 'noils' or short and tender fibres have been taken out in the process of combing," which is essentially a separation of the long fibres from the short. Tops, briefly stated, are "combed wool."

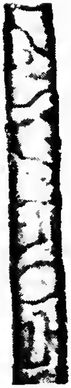
The counts or numbers that are given relating to the quality of wool, can be described roughly as follows:—32's are the strongest Lincoln wools; 36's are the finer qualities of Lincolns; 40's may be put down as Leicesters or strong crossbreds; 44's three-quarter bred Longwools; 46's and 50's are half-breds, according to quality—half-bred Leicesters would be 50's, and half-bred Lincolns 46's; 56's would be quarter-backs—that is, quarter Longwool and three-quarter Merino—or Corriedales; 58's Comebacks; 60's is an ordinary quality Merino; super 60's, 64's, 70's, 80's, 90's, etc., with intervening grades, are also Merinos up to the finest quality. I am aware that many readers with a knowledge of wool will perhaps differ in some degree from the above definitions, but they put the matter in about as popular form as can be managed.

Wool possesses all the qualities which go to make it a perfect textile fibre. It has sufficient length of staple to enable it to be spun, and when the fibre is examined with a powerful microscope it reveals numerous saw-like edges all round it. These saw-like edges give to wool the power of felting, a quality which very few other textile fibres possess. The saw-like edges of one fibre fit into those of another, giving the material a closely matted or felted appearance. This felting property of wool is seen in woollen felt hats, also in fine woollen cloths such as are used for suitings. The finer the wool the better its felting qualities, because it has more serrations and saw-like edges per inch than the coarse quality wool. Fine wools are usually very short in the staple, while the stronger or coarser wools are much longer. There are many technicalities and interesting figures in connection with the wool fibre, but as already pointed out, they hardly come within our province, and an intimate knowledge of them is not imperative to the wool grower, or to ensure his success.

We must, however, consider some of those points that do concern the grower, and which go towards determining the price to be paid for his clip, for this after all is the main consideration actuating the man who raises sheep for their wool. To the mutton breeder they are not so important. "Condition" is one of the important factors to be borne in mind, for when buying wool in the grease, yolk, dirt, burr and other foreign matter must be taken into consideration. The buyer purchases on a scoured wool basis, therefore any miscalculation in the ultimate scoured weight will have an appreciable effect on the topmaker's profit. Consequently the grower has to remember that though his sheep may cut very heavy fleeces, it does not necessarily follow that his wool cheque will show corresponding dimensions. The buyer does not buy yolk, burrs, etc.; he pays only for wool.

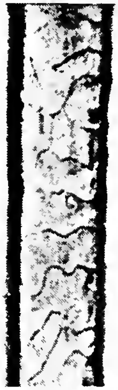
What is known as yolk, or grease, in wool is in moderation necessary to the health and condition of sheep and their fleece.





1. Queensland fine Merino, magnified 500 times. Diameter $\frac{1}{1333}$. Serrations 2330 to inch.

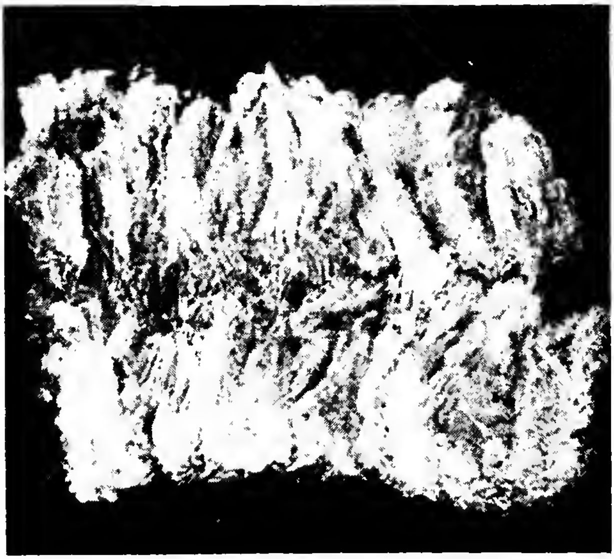
2. Super Merino, Western District, Victoria, magnified 500 times. Diameter $\frac{1}{1777}$. There are 3535 serrations to 1 inch.



3. Lincoln wool, magnified 250 times. Diameter $\frac{1}{570}$. Serrations 1385 to inch.

4. South Australian strong Merino, magnified 350 times. Diameter $\frac{1}{935}$. There are 2040 serrations to 1 inch.

It is an excretion through the pores of the skin and runs through the length of the fibre, is in fact the life blood of it. When the hollow which carries this yolk into the fibre becomes affected and diseased by drought and other conditions causing poverty of the bload, the flow of yolk ceases, and the fibre becomes dry and starved, with the result that a sort of partial rupture is created, and we have the condition known as "break" or in a modified form, "tenderness," in the wool. This, of course, means a loss to the grower, as the fibre is broken in two when being combed, and becomes "noils," which fetch considerably less money. With the return to better health, the fibre is properly nourished, and goes on growing again, but the "break" or "tenderness" is there and can be detected by even the untrained eye. It is a condition, of course, that cannot always be helped, especially when due to drought, to combat which all approved means have been tried, but on the other hand, it is sometimes caused by careless dipping and other phases of bad management. On condition, then, we have shown that the price to be paid for the wool largely depends, and though the grower can do nothing when baling up his clip to lessen the amount of



"Break" in Wool.

yolk or remove the burrs or other foreign matter, he can by judicious classing minimise the loss that they entail. This is a matter, however, which will be exhaustively treated in a later chapter on classing.

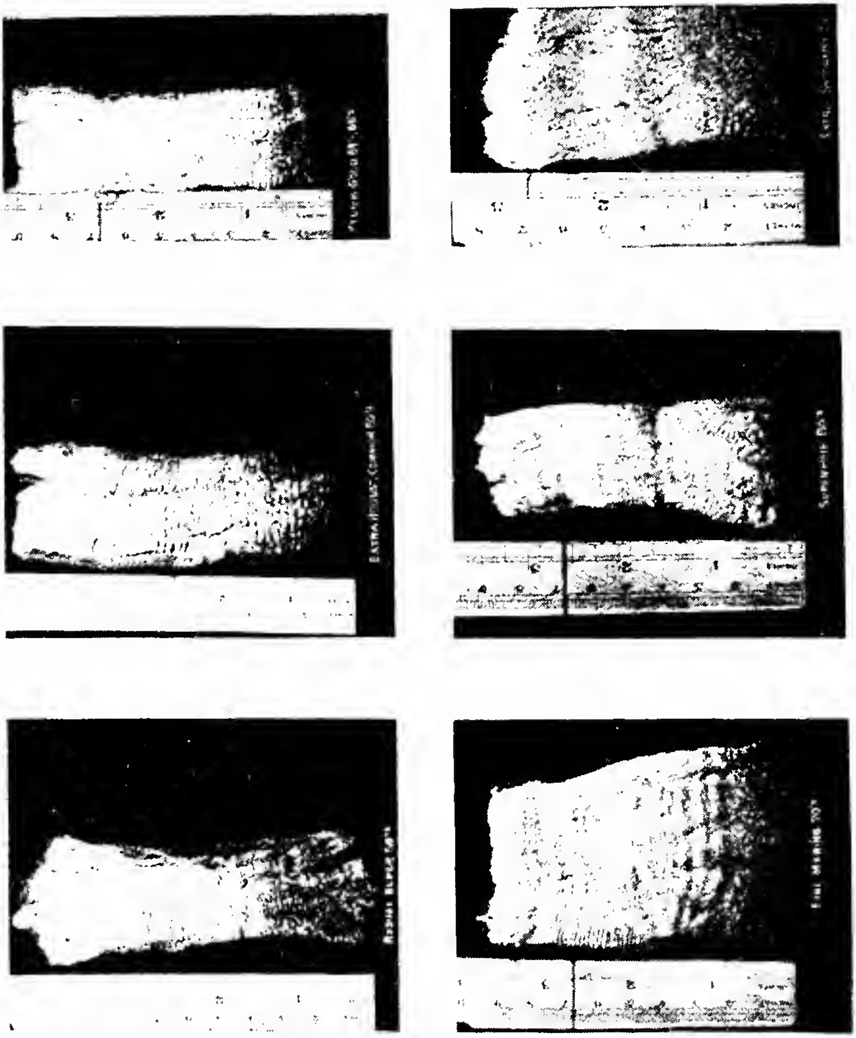
The next point is "staple," and the longer the staple, in proportion to fineness, the more it is valued by the "trade." Broadly speaking, it may be said that the finer the wool, the shorter it is, and the stronger the wool, the longer the staple. Superfine Merinos should be not less than 1½ to 2 inches long, medium Merinos 2½ to 3 inches, and the strong-woolled from 3 to 4 inches. An uneven staple, that is, different lengths of wool on different parts of the sheep's body, is to be avoided, though, of course, it will be understood that no man expects the wool on the extremities to be of the same length as that, say, on the shoulder. To secure as great a degree of evenness as possible over the frame is the object to be aimed at, and the staple in handling should feel as though it contained body, in contradistinction to being "mushy." The fibres should run parallel and not show a matted appearance.

Lustre is another essential of wool, and should be present in all grades from the pure Lincoln to extra superfine Merinos, though the brightness and radiance found in fine Merino wools must not be confounded with the lustre found in coarse wools, which is due to an increased reflection of light thrown from an elongation of the scales which cover the fibres of every quality of wool. The stronger the wool the longer these scales become, and consequently the more light reflected. Lustre is an indication of health and strong textile resistance, but the application of the word has distinct reservations.

We next come to "character," which we can best define as the wave-like "crimps" that should run the whole length of the fibre right out to the tips. All good wool should show this crimp, and the finer the wool the closer the crimps become, until in extra-superfine Merino it is difficult to see the individual waves with the naked eye, though a general soft wavy radiance is there.

"Density" is another point, and no further definition is required than that furnished by the word itself. Naturally it means that the denser the fibres the greater their number, and consequently the greater the weight of the fleece. It also gives the fleece a greater power of resistance against the intrusion of foreign matter, and generally means a much increased measure of protection against inclement weather. We have all seen sheep lacking in density with pence per lb. knocked off the value of the wool on the back. The fibres, not being sufficiently dense to stand up, have opened out and admitted periodical quotas from every passing shower and cloud of dust.

Coming to the fleece as a whole, there are about 15 different variations in quality on an average Merino, but the distinctions between them are so small that the classing of the fleece into this



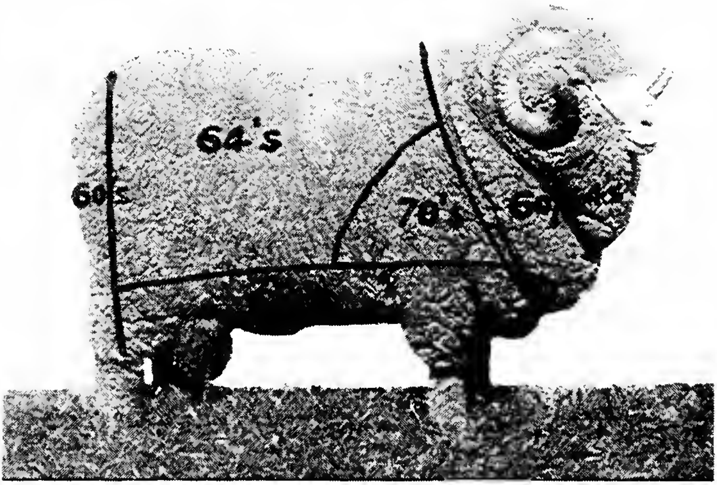
Grades of Australian Merino Wools, Showing Crimp.

number of sorts is quite unnecessary. For all practical purposes the Merino fleece may be charted in three classes, namely, 60's, 64's, and 70's, and gives the following average :—About 10 per cent. is 70's quality, 43 per cent. 64's, 40 per cent. 60's, 4 per cent. "shorts" or noils, and 3 per cent. dirt. Noils are simply short fibres which are thrown out by the combing machine, and the greater proportion of noils to that of top, the less value will the grower get for his material. This is an important point to remember.

The body of a sheep has a governing influence on the class of wool grown. A big square sheep, with well-set body, fairly long on the legs, will have a tendency to run strong in the wool, while the very high grade wools, so rare and hard to keep to type, are usually the product of finely formed, light-boned sheep. In extra fine wool the difficulty is to prevent the fleece going too light, dry and fluffy, and this is one of the reasons why breeders in Australia are breeding along the lines of least resistance and producing a sound useful grade of Merino wool that will always find steady favour in the world's markets.

It is, of course, not an easy matter to acquire the art of correctly assessing the various qualities of wool, and while to a few it is a natural gift, there are many who never achieve it. Strive as much as possible to handle the fleece on the sheep's back, and by the finger tips and brain endeavour to grasp the significance of the difference in quality of varying portions of the fleece. As already explained, there are in a single fleece certain clearly defined grades, and for our purpose we may take 70's as the finest of them. This wool will be found on the shoulders, then 64's along the ribs and back as in the sketch on page 164; 60's to 64's on the neck; 60's along the hindquarters, and the same on the belly. The belly should be well covered, an important point, as it is often taken by sheep buyers as an index of an all-round, good-fleeced average sheep. The breech is the poorest wool on the sheep's body, but there should be plenty of it. The hind legs must be well-woolled down with wool of fair quality, showing no hair, and the whole fleece should be free from highly-coloured yolk.

In examining a fleece on the sheep's back, first open up the shoulder, which is the basis or standard from which subsequent findings are to be deduced. Then look at the top of the head, the roots of the tail and the neck folds, carrying in the mind's eye all the time the character and quality of the shoulder wool. Next open the back, but remember, as previously pointed out, that the wool here should be of good length, dense and bright. A faulty fleece in this part, that is to say a thin backed one, admits much dust, dirt and rain, and greatly detracts from an otherwise good fleece. The ribs should always show density, long staple and good colour, and there should be character at all points, though, of course, it will vary in degree. Hairy or "kempy" wool is to be utterly eschewed, as it will not spin well, nor does it take the dye properly in manufacturing, showing in whitish streaks in the finished fabric. A few isolated hairs may be found at the extremities and in the breech, but if present in any greater measure, they are a sure sign of faulty breeding and deterioration. The wool of hoggets that have not been shorn runs into wisps at the end of the staple, but this peculiarity disappears after the first shearing. Ram's wool should always have a nice white appearance. In concluding this discussion on the Merino fleece, we may summarise as follows:— There may be found considerable discrepancy between the different counts; in fact, there is bound to be such in a minor degree, even in the most perfect fleece—but the beginner has to aim at striking a proper balance between them, realising that his object must be to



A MERINO RAM, SHOWING ROUGHLY ON WHAT PARTS OF THE BODY DIFFERENT QUALITIES OF WOOL ARE GROWN.

keep the divergence at a minimum, and to secure as even a fleece as possible. A good even fleece is half the battle, but it can only be secured by careful attention and practice.

With regard to colour in wool, by which is meant not the "occasional" stains of dirt and dust, etc., easily washed out by modern scouring machinery, but the objectionable bilious-looking yellow yolk exuded by the sheep under some conditions, this is a bad point, as Bradford topmakers say that the stain can never really be got rid of. It is more constitutional than anything else, and is probably a sign that the animal is not in normal health. A flock showing this propensity should be dipped in some approved preparation, and, if possible, moved on to a change of country. It may be pointed out that the objectionable colour described should not be confused with the faint lemon glow to be seen in high-grade Merinos, which is quite a different matter.

Coming to crossbred wool, this, of course, varies according to the cross. A Lincoln-Merino first cross, for example, generally throws a strong plain-bodied sheep with good-stapled light-conditioned wool, lustrous and shafty, of about 50 to 56's count, according to whether the progeny throws to the sire or dam. Coming to the three-quarter bred, or longwool ram on the half-bred ewe, we get about a 46's quality, the wool now beginning to show pronounced lustre and the crimps becoming more expanded. The "comeback" or progeny of a Merino ram on the half-bred ewe gives a very good class of wool, competing with strong Merino. It may be classed as 58's quality, and has a shafty, close staple, giving softness with strength. It is bright, light-conditioned and elastic, and first quality comebacks hold an assured position in the market.

The Corriedale, as already described, is really a fixed type of good half-bred, and yields a wool of about 54's quality that has attained great favour with manufacturers on account of the evenness, length and fixed quality of the fleece, proportionately, throughout. Corriedale hoggets' wool is particularly good, and sometimes runs to six inches in length. The breed is proving very popular, and the good growth of staple, light condition, and character evinced by the crimp in the wool assure for it a continuance and increase of that popularity. Bradford top manufacturers state that Corriedale wool is a most useful article, and seldom varies in its evenness of growth.

In regard to the British breeds, we need only concern ourselves with the Lincoln, Romney Marsh, Border Leicester and English Leicester; the shortwool breeds, such as Shropshires, Southdowns, etc., are of interest only from the viewpoint of fat lamb and mutton.

production. Lincoln fleece is the coarsest of all the longwools, ranging from 32's up to 40's quality, and the wool is heavy, coarse, lustrous and of unusual length. The English Leicester yields a better quality, still very lustrous and strong, and of about the same density as the Lincoln. It does not cut as heavily as the latter, but has better weaving qualities. The quality of Border Leicester wool runs from about 40's to 50's, and crossed with the Merino, this breed gives a good-stapled, bright, light-conditioned wool, dense and fairly soft. The Romney Marsh grows a good medium stapled wool of about the same count as the Border Leicester, the fleeces of these two somewhat resembling one another, though the latter is probably more lustrous.

Lambs' wool of the best superfine Merino type, with its beauty, softness and radiance, is at the very apex of the wool world. In varying qualities, length and condition, it is in constant demand, but it must be remembered that, as in grown sheep, "quality" is the first consideration. Colour is another most important point, and a good sample of superfine lambs' wool should be very white, as well as soft and silky to the touch, of fair staple and free from "burrs," and, of course, crimp or character should also be shown. It will be understood that this class of wool only retains its particular qualities up to a certain age on the lamb's body, and the grower must determine for himself whether it is going to pay him to shear his lambs. It, of course, means extra expense, and there are other factors to be considered, such as the subsequent growth of the wool, etc.; if there is a large number of lambs carrying an extra good quality wool, the enhanced market price for such may pay the owner to shear, but on the other hand circumstances may not warrant such a course. However, the subject will be discussed in a later chapter on shearing.

A reference was made on a previous page to "burr" in wools. This foreign adjunct that necessitates so much heavy skirting of fleeces over a lot of country in Australia is removed by what is known as the carbonising process. This requires special plant, and certain Continental countries specialise in carbonising wools. Unfortunately those countries who prior to the great European war treated the bulk of this class of wool, were those whose mills fell into the hands of the Germans in 1914. The result was a slump in the market for the article, and even when the war ended and possession of the mills was regained, it took a long time for the ruined machinery to be replaced, while all the time thousands of bales of burry or carbonising wools banked up, the British Government, who had bought them, not being willing to sell them at a sacrifice. The disposal of this class of raw material proved one of the greatest difficulties that faced the authorities at the head of the wool business in the days of its control during the war and after.

In conclusion it may be said that the grower of wool, be it Merino, crossbred or longwool, has first of all to acquire the wool "sense," to which both fingers and brain contribute; he must assimilate a knowledge of the good and bad qualities and characteristics of wool, and he must learn how to apply that knowledge in arriving at a standard or basis on which to judge the individual fleece. No sheep will be found absolutely perfect in its covering in every particular, in quality, in evenness, in character, in colour, etc., but by practice and acquired skill it should gradually become second nature to assess the attractions and detractions at their true value, and arrive at a correct estimate of the whole. As to improving the fleece, establishing valuable characteristics, and eliminating bad ones, this is a matter of classing and selection, and under that heading will be dealt with in a separate chapter.

CHAPTER XI.

CROSS-BREEDING AND MIXED FARMING.

Cross-breeding—Definitions of Stages of Cross-breeding—What is the Best Cross ?—The Border Leicester—The Lincoln—The English Leicester—The Romney Marsh—The Suffolk—Down Crosses for Fat Lambs—Choose the Right Type of Stock—Use Good Rams—Feeding—Rape, Clovers, etc.—Breeding—Putting in the Rams—Treatment of Ewes in Lamb—Cross-breeding Systems—Fixing a Type—Crossbreds v. Merinos in Drought—Sheep and Crops on the Farm—Crop Rotations—Putting Sheep on to a Crop.

The utilisation of sheep with agriculture is becoming more and more widespread every year, and the young man starting on the land who cannot find the capital necessary for a purely grazing proposition will direct his attention to *mixed* farming. With the constant subdivision of large estates, the pure Merino loses a great deal of his scope, and the use of crossbred sheep grows more general. To get interest out of the land, land on which present market values are paid, cultivation must be resorted to, and the more perfect the system of cultivation the less will the farmer be at the mercy of the seasons.

Grazing suits the big areas, but farming in all its branches is required to make a success of the small holdings Thorough cultivation and rotation of crops are two basic principles, and to carry these out successfully sheep are essentials. They feed off the young crops, and while improving the prospect of the grain or hay yield they turn into good money. They do well on the stubble, and they manure the land all the time. Now, the Merino is not the class of sheep for this purpose, and it is here that the crossbred comes in. There are, however, innumerable different varieties of crossbreds, and it is practically an impossibility to advocate any particular one. As a matter of fact it cannot be done, for the reason that though on certain country one type of crossbred would give a profitable return, that same type on different country or under different climatic conditions would prove worse than useless, that is to say, the cross that suits one district would not necessarily suit another, and that which suits one man's system of farming perhaps would not suit another's. It remains for each man to settle this question for himself, but while it is not possible to lay down hard and fast rules to apply generally, it is very useful to know what has been done in these matters. An endeavour will be made later on to give the reader some rough idea of the crosses best adapted to different styles of farming and to different classes of country, but as already stated it can only be done in the most general way.

Although the crossbred has only been discussed in connection with what we have called mixed farming, it must not be thought that this class of sheep is for the small farmer only, and that the large owner should keep entirely to the pure Merino. There are many large sheep owners in Australia who have rich flats, or otherwise suitable country, which could be most profitably utilised for the production of a better quality of mutton and lamb for local or export purposes. Over the greater part of Australia, on account of dry conditions and uncertain pastures, the pure Merino must always reign supreme, but if all those big owners having suitable country went in more for the best crosses, the result would be decidedly profitable. There is already a tendency in this direction, and late years have been characterised by increasing demands from big station owners for Longwool rams for crossing purposes.

By no means is it intended that big Merino flocks should be materially reduced, but rather some such system as the following should be adopted :—Set apart a number of Merino ewes from the main flock ; they may be culled for age, and put them with Longwool rams. The progeny, the first cross, is always profitable. The wethers sell more rapidly than the pure Merino, and they cut fleeces of good value. The ewes for breeding purposes are also an improvement on the Merino, and they can again be put with the same breed of Longwool rams, when a three-quarter-bred Longwool is obtained. Here, again, a profitable type of sheep has been evolved ; the wethers shear well, and bring good prices in both store and fat markets, while a good-framed, strong-constitutioned, prolific ewe has been obtained, from which fine crops of lambs can be got by rams of British breeds.

It may be as well, before going further into this subject of crossbreeding, the main object of which is really to produce fat mutton and lamb for export, to define the various terms used in connection with the business. A crossbred sheep is, strictly speaking, the progeny from two different breeds of sheep, and therefore a half-bred is a crossbred, but custom rules these matters, and we call the first cross from two pure breeds half-breds, half one breed and half the other. The term half-bred is used to denote the progeny from the mating of a Merino and a Longwool. If a half-bred ewe is mated to a long-woolled ram the result is a three quarter-bred—that is, three-fourths Longwool and one-fourth Merino. This is called a three-quarter-bred. It is also a quarter-bred because of its quarter of Merino blood, but that would cause a confusion of terms, and therefore it is customary to call them three-quarter-breds, and to define quarter-bred in another way.

A quarter-bred, or "comeback," as it is called, is obtained by putting a Merino ram to a crossbred ewe. A crossbred is usually defined to be any cross which has more Longwool blood than a three-quarter-bred, but sometimes, though seldom, we speak of a seven-eighths-bred, and that is the next stage from three-quarter-bred towards pure Longwool sheep, and is really one-eighth Merino and seven-eighths Longwool, but it is called, in general terms, a crossbred. The fleece is the best guide, and in classing a clip three-quarter-breds and half-breds are classed separately, and the rest as crossbred, which is coarser wool than the other two, the Merino strain having practically been crossed out.

Coming now to the difficult question of which cross gives the best all-round service, we will first of all study the results of a series of experiments carried out over a long term on a number of Government experimental farms in New South Wales, and note how the breeds compare with one another respecting the various aspects of their use. So many issues are involved, that no single merit can be counted on alone. The serviceableness of the breeds must be reviewed from the broader standpoint of all-round efficiency. Because a breed excels in one particular direction, it does not necessarily follow that it fulfils all requirements. Its disabilities in some respects may quite overshadow its special recommendations. All points, therefore, must be carefully measured, and all attributes of the breeds weighed, before one can make so bold as to say that either this one or that is the most useful type. It is not to be expected, in view of personal preferences, that the views that follow will be in accord with those of many engaged in the business, but the results of the experiments may throw some light on many vexed questions, and act as a guide to those contemplating engaging in the cross-breeding industry.

Mr. J. Wrenford Mathews, New South Wales Government Sheep and Wool Expert. summarised the findings of the experiments referred to as follows (N.B.—Where the word "Leicester" is used alone. English Leicester is meant):—

(1) Longwool on Merino.—As the result of these and previous investigations, we can emphatically state that of all breeds none are so suitable for mating with the Merino as Longwools.

(2) Merino Ewe in preference to Longwool Ewe.—In view of its natural adaptability to the country, and the manner in which

it conforms sexually to seasonal conditions in the districts where cross-breeding can profitably be undertaken, it is preferable to mate the Merino ewe with British-breed sires, although in certain connections British-breed ewes may be mated to Merino rams with advantage.

(3) Time of Mating.—Under the generality of New South Wales conditions, an autumn lambing is desirable. November and December have, therefore, been set down as the most seasonable months during which to run the rams with Merino ewes.

(4) Period of Service.—In the case of the Merino, the period of sexual heat usually occurs on or about the seventeenth day, and the ewe generally remains in that state for about twelve days, although in some cases the duration is shorter, while in others it is longer. To secure pregnancy, the period during which the rams are run with the ewes should not be less than six weeks, and should not exceed two months; a longer mating period would result in an unduly protracted lambing.

(5) The Readiest Breeder.—Further, it has been discovered that the crossbred ewe is a less ready breeder than the Merino, except during certain seasons. The Merino ewe will join with the ram at practically any period of the year. The crossbred ewe, on the other hand, shows a preference to certain months, and January and February are the months during which the rams perform the best service.

(6) Disposition to Breed.—The disposition to breed was not apparent in any one breed more than another; in some cases it was noted that certain rams were more vigorous than others, but this was irrespective of breed.

(7) The Natural Increase.—The figures taken in this relationship show the Leicester to an advantage of 6 per cent. in the aggregate over the Lincoln and Border Leicester, which were about equal, as the result of four years' mating at each of three farms.

(8) The Disability of the Ewe.—The records as to the difficulty often experienced by the ewe at parturition hardly confirm or detract from the merits of any of the breeds. The figures, in fact, are somewhat inconsistent, for while considerably fewer ewes mated to Leicester rams were assisted, the mortality, strange to relate, was slightly higher. On the other hand, the Border Leicester comes out with highest percentage of those assisted, but with fewer deaths. The Lincoln occupies an intermediate position in both respects. In almost every case the trouble in respect of the Lincoln cross was due to largeness of head; while in the majority of instances that of the Border Leicester cross was through fullness of shoulders

(9) The Older or Younger Ewes.—On the point of difficulty at parturition, we could not discover the younger—the maiden ewe—to be physically any better constituted than the ones which were older. The opinion formed was that the older ewe was the best mother, and her affection in this respect more than compensated for any advantage which may be claimed for the younger ewe on the score of flexibility.

(10) Conformity in the Cross.—Viewed from the standpoint of conformity, all breeds presented a fairly uniform blend, though in certain directions there were noteworthy differences that distinguished one cross from another. The Lincoln furnished, on the whole, the cross most regular in outline—a character that became more marked as the sheep advanced with age. The progeny of the Leicester, though square, was fairly short of body, but with particularly well-rounded hindquarters; a marked deficiency, however, was the comparative narrowness of the forequarter, and the shortness of the brisket. The Border Leicester produced a broad, long-bodied sheep, fairly equal in conformation, high on the leg, and with full hams, deep shoulders, broad loins, well-rounded girth, prominent brisket, and capacious chest.

(11) The Lamb Stage.—So far as first crosses go, the Border-Leicester undeniably furnished the most suitable class of carcase for export, though it would be as well not to place too high an estimate on the value of the cross for this purpose at this stage. First crosses reach their maximum development between the 2 and 3 years stage, so that to allow for development, the 18-months' stage seems about the earliest stage at which the animals can be profitably marketed.

(12) Border Leicester's Advantage in Body Weight.—The Border Leicester shows a material gain in body weight over the other two crosses at practically all ages. The differences in its favour in the case of wethers, taken on the average from the ages of 1 year 5 months to 5 years 5 months, amounted to approximately 15 lbs. as compared with the Lincoln, and 19 lbs. as contrasted with the Leicester crosses. The increase in the case of the ewes was not so great. Taken up to the 5 years 5 months stage, it showed an average of 6 lbs. over the Lincoln, and 11 lbs. over the Leicester.

(13) The Lincoln's Advance in Wool Weight.—The Lincoln maintained supremacy throughout in the matter of wool production. In the case of the wethers, the results reveal a gain covering all ages of 1 lb. 6 ozs. over the Border Leicester, and 1 lb. 5 ozs. as contrasted with the English Leicester. With the ewes the difference was 1 lb. 2 ozs. as compared with both English and Border Leicesters, which were about equal.

(14) Variability and Coarseness of Lincoln Cross Wool.—Less variation in the wool appeared among both Leicester and Border Leicester crosses than with the Lincoln. The wool of the latter was also coarser, though the extra weight of fleece stands as a compensating factor in assessing its total monetary value.

(15) Higher Yielding Qualities of Border Leicester Cross Wool.—On the whole, the Lincoln cross gave the highest clean yield ; but taking quality for quality, or grade for grade, the Border Leicester cross produced a higher yielding wool than either of the strains with which it was competing.

(16) Higher Value of Border Leicester Wool.—Owing to its finer quality, Border Leicester cross wool is, on the average, 1½d. per lb. more valuable than Lincoln cross wool, and, further, owing to its higher yield, is about ½d. per lb. more valuable than the wool of the English Leicester cross.

From the above, the Border Leicester, taking the combined viewpoint of wool and mutton, would appear to fill first place. He is a well-built, active, good-constitutioned sheep, the lambs mature early—making a very neat lamb at 4 months—and are readily taken by the freezing companies. It is not necessary to get rid of the ewe half-bred weaners as the Border Leicester ram can be again crossed with the half-bred ewe, producing excellent mutton, not too fat. The cross is very hardy, and the sheep are splendid fossickers, while the wool is more like an extremely bold, robust Merino than crossbred ; plenty of body, not fuzzy, and plenty of character. One authority says :—"For rich pastures, if sound, and plenty of water handy, and near a railway, the Lincoln is a most suitable sire, and the wethers may be sold off at 2-tooth for freezers. For country not so rich, and any distance from a railway, the Border Leicester will be found much more suitable, being more hardy, and there is less fatality in the ewes when lambing." With the latter half of this sentence, however, many men will not agree, as the shape of the head and shoulders often causes trouble with young and undeveloped ewes. In New Zealand the Border Leicester is found to be splendidly adapted to the undulating rolling country, of which a large area in the South Island is comprised.

Turning again to the results of the experiments summarised by Mr. Mathews, we see that the Lincoln occupies the premier position in the matter of weight of fleece, although it is coarser, and shows more variation than the Leicester or Border Leicester crosses. From the carcase viewpoint it does not achieve the gain in body weight of the others, and the cross, though a remarkably good sheep, takes a long time to mature unless there is plenty of artificial feed. They do well on most soil—if not too hilly. They are not good climbers, being somewhat on the lazy side. Of course, we are speaking mainly at present of first crosses or half-breds, and it does not necessarily follow that because a breed may not be most suitable for this purpose, it may not be a very good foundation in a case where a cross is intended to be gone on with and persevered with to establish a type. Take, for example, the breed under discussion, the Lincoln, which is one of the foundations of the Corriedale, the result of a cross that was persevered with till finally a fixed type was established.

The chief defects of the Lincoln are that he makes too much tallow, and is liable to lung worm. It is also questionable whether he is as strong constitutioned as the Border Leicester, Romney, etc., and for this reason he should be used only on land of good quality, where, however, results from the use of the breed should be as profitable as from any other.

The English Leicester is in many respects a very excellent sheep, and one which carries a fairly heavy and useful fleece of wool, whilst it also possesses considerable merit in the shape of being fine in the bone. It lacks, however, the perfect butchers' carcase of the Border, and is a bit on the delicate side. On the right country, however, it will give a very nice lamb with a good percentage.

The Romney Marsh is a good doer, can withstand footrot, does not carry as heavy a fleece as the Lincoln, though of better quality, and is longer in the staple than the Border Leicester. Rather a fault is the large head, which is a detriment to the ewe in casting the lamb. However, the loss in percentage in lambing is more than made up for by the breed's general good qualities. It has a splendid constitution, and in a moist cool climate, with country where sheep are liable to disease, viz., footrot, worms and fluke—should certainly give the best results of all crosses. While being a strong, hardy, big-framed, quick-maturing sheep, he does not stand very high as regards weight of fleece, and in the North Island of New Zealand breeders have crossed with him the heavy cutting Lincoln. The conditions there are such that it has been found that the most profitable system of breeding is a cross between the Romney and the Lincoln, the former supplying the necessary hardiness and the latter attending to the wool cutting aspect of the business. While on the subject it may be mentioned that there are little points in this Lincoln-Romney cross-breeding which, if observed, go far towards success or failure.

Those who have been going on the Lincoln for some time require from a wool and constitution point of view recourse to the Romney.

The Lincoln being a comparatively coarse-woolled sheep, growers in selecting their Romneys are inclined to choose fine-woolled rams to hasten the desired change. But here the experience of the successful wool grower comes in. In making the change he does not make a violent departure by selecting the finest-woolled type of Romney, but he chooses rams with good robust wool and a decided lock, so that the fusion will be more gentle, and greater uniformity of progeny the result. The difficulty is now to get the class of Romney ram most suitable for the purpose of mating with the Lincoln. The sheep required for the grazing runs of the North Island of New Zealand requires constitution and ability to carry a profitable fleece—and carry it well on his back. On large North Island runs, where they persist in the Romney-Lincoln breeding, they keep rams of both breeds simultaneously, and class their ewes into fine and strong, sending the strong-woolled ewes to the Romney rams and the fine-woolled to the Lincoln rams.

The Suffolk is a breed that should give good results in crossing. The quality of the mutton is excellent, with a large proportion of lean meat, and their robust constitution and power of endurance, as stated in a previous chapter, render them very suitable for country where they have to cover a lot of ground in search of food. The cross on a long-woolled breed gives an animal yielding a heavy fleece of good wool, and a very superior carcase of meat. The breed, however, is practically in its infancy as far as Australia and New Zealand are concerned.

With regard to the Down breeds, Shropshires and Southdowns, these have their use almost solely in the production of fat lambs for the export trade, and have little to recommend them from a wool point of view. They make good mutton, but as we are trying to find the most remunerative dual purpose cross, we must eliminate them from consideration. If Southdown or Shropshire lambs cannot be sold as fats off their mothers they are apt to become a drug on the market. They do not compare with the Longwool cross as wethers or breeding ewes. To return their full value they must be disposed of as lambs, and to do this one must have suitable country adapted to the cultivation of fodder crops. It may be stated here that the Down breeds the last few years have had to take a back seat, as owing to the war and the greater demand for wool, the fat lamb trade has received rather a check, and the swing of the pendulum is towards bigger sheep and more wool. Of course, it may be only temporary, but the dull demand for rams of the Downs breeds has been very noticeable during the last two or three years at the New Zealand sheep fairs. Fashions change just as radically and nearly as frequently in sheep raising as they do in woman's dress. If the demand for meat becomes greater than that for wool, we shall certainly see the bulk of attention directed to the sheep's carcase, and not his covering. As things are, however, it seems fairly certain that weight rather than fine quality will rule the lamb and mutton markets for some years to come, and wool must remain a primary consideration.

A brief résumé has been given of the various breeds in their adaptability for crossing, and the beginner now has to make his choice. He should cultivate observation, exchange ideas with other breeders in his district, carefully sifting out the opinions that will be useful to him, and discarding those that tend to weaken what he knows to be right.

After finding the best cross suited to local conditions, he should keep to it. He may easily be persuaded and influenced into running many types and crosses, and unevenness in his wool clip must be the natural consequence. The further one goes from the first cross, the greater is the difficulty of establishing uniformity in the wool and type of sheep generally. While the carcase and early maturing qualities are of the greatest importance in sheep run in conjunction with cultivation, the type of wool should not be lost sight of. The sheep, for whatever purpose they are bred, must grow wool, therefore it should be of the best quality, density and evenness, consistent with fattening and early maturing propensities. As far as wool is concerned, then, each grower should avoid any unnecessary confusion of type by haphazard and indiscriminate crossing. Wherever it is found that the first cross pays best, it would be wise to keep to that cross, but, as a matter of fact, experiments indicate that the second cross is the best sheep constitutionally, first cross next, and comebacks third, and as fatteners they stand in the same order. The cross containing a greater proportion of the blood of British breeds is unquestionably a better fattener than one containing a greater proportion of Merino blood.

The basis of the majority of crossbred sheep is the Merino, and in order to get the best results the foundation must also be of the best. All Merino ewes are not suitable for the purpose from the point of view of conformation and wool. The male and female must not be too opposite, and the wool of the ewe should be of the strong combing type, not too strong, of course, although better this than too fine: finally, there should be a similarity in the conformation of the carcase, so that the progeny shall not be too diverse, and that the drop may be uniform in character. If the ewes are not of the character described, the lambs will not be uniform; some will lean to one side and some to the other. In any case the lambs will not all be uniform, but the discrepancy will not be so pronounced if the right ewes are selected. If the right type of Merino ewe can be procured to mate with well-classed Lincoln or Border Leicester sires, the resulting lambs are ideal first crossers on most country. Ewes that have been through the classer's hands three or four times are very suitable for this purpose.

Flock rams should be purchased from good studs, distinct and clear cut representatives of their breed, as well covered as possible. Get sound 2 or 4 tooth animals, with plenty of vitality. Unfortunately there is a tendency to think that any sort of sire is good enough for cross-breeding, and not only does this tendency help to deteriorate crossbreds generally, but it is ruinous for the individual flocks. Other faults are the use of dams without regard to proper rules of breeding, and the selling of all lambs suitable for export while retaining the culls to become the breeders of the future. If the grower can only afford one sire, it should be a good one, as one good sire may ultimately repay him, while three or four not up to standard will retard his endeavours in many ways. He should adopt the same lines in procuring females, *i.e.*, a few good ewes are better than twice the number of inferior ones. Always keep in mind that it is the foundation that matters, and if it is well laid there will be less likelihood of faults in the superstructure. The mistakes, if any, can then be more easily bred out or counteracted.

The man who buys rubbishy rams is paying money for all sorts of faults and objections, which he proceeds to distribute throughout his flock. The whole fabric of breeding is built on the great natural law that "like begets like," and to the end of all time rubbish can only beget rubbish, turning the scale of progress downward. As a rule, it is safest to purchase only from registered flocks.

Feeding is a great stepping stone to success after one has hit upon the best cross for his particular locality. Sheep to do well should not be gorged, nor yet stinted. An observant owner can fairly gauge the feed in a paddock after a few seasons of occupation. "Sheep, or in fact, all stock to be fattened," says "Crowfoot," in "The Pastoral Review," "should, if off grass, before going on to a change of food, such as rape, clover and rye-grass or lucerne, have a turn on a laxative diet to clean them out. If put on direct, a number always get sick, entirely dietetic. For instance, before putting sheep that have been running for some time on bush grasses on rye-grass and clover or lucerne, they should have a short spell on rape or green oats, just to clean them out, these plants being laxative. They then come away from the jump. For topping up lambs, nothing in my experience beats rape, where it will grow, but sheep to do properly on it must be brought on gradually and changed every ten days or so. They do not do well on too uniform a diet, so they must get artificially what they get on natural pasture, viz., variety. It costs more to fatten on rape than lucerne, the former being an annual whilst lucerne is perennial, and will last five or six years if properly treated. Exercise is necessary in fattening or growing, as it aids digestion, so they want to have to hunt a little for their food. Sheep farmers who crossbreed for lambs should always keep in view reputation. Breed to establish a name, not the 'freak' just to catch a good market here and there, because the 'chickens, especially the bad ones, come home to roost.' A buyer well satisfied is always inclined to come back, and it is a good policy to have steady sales rather than spasmodic ones. Gambling only succeeds occasionally."

With regard to rape, mentioned by "Crowfoot," there is no question about its feeding value, and the land is much improved for subsequent crop of wheat and hay. It can be strongly recommended to the mixed farmer, where soil and climate are suitable, but it is somewhat risky and likely to cause trouble if injudiciously fed. Graziers could readily grow this fodder crop in a wholesale way —in fact, it has been done—for fattening sheep and lambs. Sow the seed through an ordinary seed drill in large paddocks, and do not cultivate at all after sowing. It is advisable to give sheep access to grass while running on the rape, and to take them off during rainy weather. The plant requires a good strong soil, well drained; any water lodging on the surface is fatal to its growth. The soil must be worked up to a fine tilth. The seed must be covered very lightly by means of either a brush harrow or a roller, and the plants must not be too closely fed down. If the crown of the plant is eaten by the sheep it will give out. Neither must it be permitted to attain too rank a growth before the sheep are turned on to it. Mustard should be sown with the rape as a corrective, say 2 lbs. of the former to 4 or 5 lbs. of the latter. If it is deemed desirable to grow seed for future sowings a patch for the purpose will have to be fenced off and all stock denied access to it; but, probably, until the grower becomes familiar with its mode of cultivation and growth, it were better to depend on seedsmen for supplies of seed.

The clovers are good fatteners, mixed with other pasture. Red clover by itself is too gross, and sheep "bloat" very readily on it, especially Merinos. For sheep-fattening pasture (where it will grow properly) English rye-grass and white Dutch clover mixed are hard to beat. Clovers alone are not very successful, as the fat formed by them is too oily. The rye-grass with them gives them ballast, and makes them more easily digested. The best way to fatten sheep on rye-grass and clover is to put them on mustard and rape for a fortnight or so, which cleans them out, and then when they pass on to the grass and clover fields they begin to build up fat at once. Red clover requires a mild climate and a good deal of moisture. "Alsike" clover is supposed to be a cross between the red and white; it grows bunchy, and is good sheep pasture with other plants mixed.

Turning from the feeding to the breeding, see that the rams keep with the ewes, as often rams, especially the Lincoln, Leicester, and Downs, will be found in a corner of the paddock by themselves. If half their time is spent away from the flock a poor percentage will be the result. A month is a long enough period over which to spread the dropping, for if the lambing is extended, it means uneven lambs, and uniformity in size is a most important factor. A buyer always buys on the smallest, or most defective ones, and the great thing to be arrived at is to have as few rejects as possible on one's hands. April or May are good lambing months in Australia for freezers, and the lambs should then be fit to go off in September before grass seeds and burrs come along. The ewes can give the best sustenance during these months, and the herbage and grasses are in their prime. If it can be payably arranged, ewes should breed for two years in succession and then one year "fallow"; then another lamb and then the butcher. Animals require a rest the same as the land on which they feed, and as a result of this rest the lambs are finer and twins are more frequent. Ewes should have earned enough by the lambs to entitle them to one spell.

There is always a difficulty in mutton sheep in getting the rams to work early enough for an April lambing. Young rams are not so troublesome. At 2 and 4 tooth rams are fairly vigorous, but older ones are lazy beggars, and if not looked after get too fat, as they have nearly done growing at 6 tooth, and in this warm climate, if the sun is at all hot, they prefer sleep to propagating. A good system is not to have the paddock where the ewes are too large; in fact, the smaller the better, up to a certain size. Three 400-acre paddocks are better for the "serving" purpose than one of a 1000. Put in half the rams intended to be used, say 2 to the 100, for 10 days, then take the lot out, and put the second half in for 10 days. Next return the first lot (leave the second lot in) for the same space of time, then take them out. This gives about 28 days lambing, and if possible, yard the ewes, say, twice a week at night, especially if it is moonlight, and don't let them out till 8 o'clock in the morning. The rams work best from dawn to about this time. They should not be driven out of the yard, but have wide gateways two hurdles wide, that is, about 12 ft., and let them draw out themselves. Don't pack them too tight in the yard, because if too many are put in rams will not push their way amongst them. Nothing succeeds without trouble, and this is a trouble that amply repays one.

After the ewes are about 3 months old in lamb they should not see a dog until all the lambs are dropped. The dog is an indispensable animal for properly working sheep, but he is a " misfit" in the lambing flock. All foxes should be put down beforehand, so that no fox hunting is necessary. Every lambing flock should be seen once every day to relieve any ewes that cannot lamb, and to skin and remove any dead carcases. No dead animal should be allowed to remain in a lambing or any paddock, as besides being unhealthy, they attract carnivora, and in any case it is slovenly management. The lambing shepherd works seven days a week, and the only time for knocking off is when it is too dark to see the work. Though continuous, it is not laborious, and only lasts a short time; the extra lambs and ewes saved, together with the skins, should pay this man good wages.

The successful crossbreeder will be the owner who studies his farm as a book—soil, climate and general environment—adopts the best cross suitable to those conditions, culls, uses only pure rams, and gives proper attention to the ewes during their critical period, and last, but not least, sees they are judiciously fed and watered, and no matter what the country is, lets a salt lick be in the paddock always, and more especially at lambing time, as the ewe educates the lamb.

On the subject of crossing, a writer in " The Pastoral Review" says:—" A good one for butchers and export lambs is the first cross from the Lincoln and Merino, again crossed by the Dorset Horn, Shropshire, or Southdown. The progeny are of good size, and put on weight very quickly. The wool from either of these crosses sells badly, being short and harsh. The farmer should not sell his ewe lambs. After the first cross he must decide whether he will continue to breed for mutton or wool; if for mutton he must use the coarse-woolled sire; if for wool, the Merino sire; but either should be pure bred.

" On the crossbred ewe, a Lincoln ram can be used, the progeny of which will be a fine large lamb, developing into a good sheep, with wool rather coarser than the first cross. On the progeny of this cross the Lincoln sire can again be used, which will result in much coarser wool and a tendency toward the Lincoln. The farmer now possesses a large-framed sheep with a tendency towards mutton. To secure a sheep producing a good fleece of wool, he should use a large-framed Merino ram of the plain-bodied type. The result will be a sheep commonly known as a Comeback, carrying a fine fleece, which is usually in good demand. The most profitable sheep is the most perfect the country will produce. This can only be secured by close attention and culling, and to do this it is necessary to know the points of a sheep thoroughly. The points of carcase—and they apply both to Lincolns and Merinos—are depth, girth, roundness of barrel, with ribs well sprung, thickness behind the shoulder, breadth of forehead, and width between the eyes, shortness of neck and legs, and general squareness of frame. To be avoided are the thin-necked, leggy, flat-sided, narrow-made, small-footed, ill-shaped animals, with prominent staring eyes and narrow, hard faces. The carcase of a first-class Lincoln should be covered with wool, bright, lustrous, and wavy, from 8 in. to 10 in. in length, free from fuzziness, and not matted. The topknot should be free from fuzziness, which denotes a Merino cross, and so does anything like wool on the face, which should be covered with a soft white hair. Horns also denote a cross of some sort. Many farmers quite spoil their flocks by breeding from mongrels. This is one reason that farmers' clips are so unpopular with wool buyers."

Again, a well-known Merino breeder in New Zealand, after many years of practical experiment, has fixed upon the following system for working crossbreds with his Merino flock. He mates his culled-for-age Merino ewes with English Leicester rams, selling off the male progeny as lambs or wethers and keeping all the ewes. These he puts again with English Leicester rams, disposing of the male progeny as before, and keeping the best of the ewes for breeding fat lambs. He uses Southdowns for this purpose, and he gets prolific crops of well-fleshed, quickly-maturing lambs, which are sold off entirely each year.

One advantage of a system like this is that one has not to maintain the crossbred flock within itself, and so be confronted with a flock of comebacks, and the difficulty of knowing what rams to use with them. In the case referred to the breeder has a flock of half-bred Leicester-Merino ewes, then a flock of three-quarter-bred Leicester-Merino ewes. He replenishes the first from his Merino flock, and the second from his first flock, and his ewe stock are never further away than the second cross. The choice as to the Longwool breed to use, of course, depends upon the individual and his class of country.

Another instance of cross-breeding, by a South Australian station manager, may be quoted. He says :—" I have bred sheep from crossbred rams and crossbred ewes by using a first-class Lincoln ram of high quality and thickly-clad Merino ewes. In selecting the progeny to be kept for rams I always kept those having a decision of character in the wool, discarding anything inclined to be plain, rough, or fuzzy, no matter how well-clad they may have been, and taking care to have clean, soft face and ears of the pronounced Merino type, but without horns. Invariably a crossbred sheep with a head of this description will carry a fleece showing decided character, evenly and distinctly serrated, which is of paramount importance in cross-breeding, because, without it, bulk of fleece may be obtained without corresponding weight of wool.

" I used the above description of rams on one-half and three-quarter Lincoln-Merino ewes, and found the progeny remarkably good-doing sheep, of very robust constitution, most suitable for selling as lambs ; but those which I kept on to take one or two clips of wool from did not altogether satisfy me, as they were very uneven in the wool. A great many, although very large sheep and well clad, cut light fleeces of fuzzy wool of a nondescript type ; consequently I abandoned this method of breeding, except for market lambs. They are certainly much better doers than lambs got by Lincoln rams from the same sort of ewes, being closer built and not nearly so inclined to waste during transit by rail or otherwise to market. In conclusion, if breeding for wool principally, and if fattening the surplus is only to be a secondary consideration, I would use nothing but pure sires—either Merino or Lincoln—no matter what sort of ewes were being used."

The late Robert Clarke, of Bolinda Vale, Victoria, was a great admirer of the English Leicester, but he laid his finger on an important point when he pointed out the scarcity of good English Leicester flocks in Australia. Writing in " The Pastoral Review," he said : " You ask how I have maintained the Bolinda crossbred flock. Well, I will tell you as near as I can. About 45 years ago I got the management of Red Rock, which is a part of Bolinda Vale. At that time there was no system in the breeding. The sheep were principally crossbred ewes, and I found that they were far too strong in the wool. My idea at that time was to mate the Longwool ram to Merino ewes, but that, of course, I could not do. I thought the matter thoroughly out, and could not see why the Merino ram should not make a good cross with these longwoolled ewes. I made up my mind to try that system in our flock. Although I was quite sure of the result, I purchased some Merino rams at one of the Melbourne sales as a matter of experiment. Everybody to whom I had told my plans condemned this way of crossing, but all they said did not choke me off. I put the Merino rams with a flock of two-year-old Leicester crossbred ewes, and the progeny of the cross, when coming to the shed to be shorn, were greatly admired. The late Sir William Clarke rode past the ewes, and on meeting me, said he had seen the finest lot that had ever come under his notice. I can tell you they were the most even lot of crossbreds I ever saw. They were well-grown, very shapely, with massive backs and most lovely wool, which could not have been improved on.

"The second cross with Merino rams I could not follow any further, as the sheep got too small. Our country will not grow Merino sheep of any size, and the more we worked our crossbreds towards the Merino the smaller the sheep got. In breeding crossbreds you never want to use the Merino or the Leicester ram more than twice in succession. The way I am working now, and it is the simplest, is, when your ewes begin to get too fine, put them with a pure English Leicester ram, and when you find them getting too strong, put them to the Merino ram, but never go more than the two crosses either way. Always use the longest staple Merino rams you can get, and the Leicester rams should have a good, full fleece of typical wool, not long, ropy, curly stuff. A number of breeders think that short, dense-woolled Merino rams are the best to mate with Longwool ewes. That is the greatest mistake in creation, and one that so many keep on making. Get your Merino ram as large as you can, with a good long staple of good bold wool. It does not matter if it is a little open. The contrast between a fine, short, dense-woolled Merino and a Leicester ewe is too great."

The breeder who sets out to fix a type has no easy task before him. The question seems to be, in the attempt to establish a new type or breed from a combination or cross of two highly improved breeds, what is the best stage or combination of mongrel blood at which to start in-breeding the progeny ? The natural creator of all breeds, as far as we are concerned, goes on for ever on the one principle, the fittest to survive under surrounding conditions of life. When man controls (culls) he does so with a view to cultivate some characteristic of economic value, such as a peculiar quality or quantity of wool in sheep, swiftness or strength in horses, milk or beef in cattle, and so on. The improver of breeds must have an eye for constitution and symmetry, as well as for that particular product for which he specially breeds his animals, so that he may not lose that first of all qualities, "fitness to survive." He must also have a strongly-fixed conception of the style of product and animal for which he is striving, such that, although his ideal may improve with his experience, it will not alter so as to interfere with the continuity of his purpose in selection and treatment. In sheep it would not take so long to fix a type as in cattle and horses, as considerably more generations of sheep than cattle or horses can be produced in a breeder's lifetime. Changes of management through death or any cause militate against the establishing and continuation of distinct types artificially formed.

It may be urged that by crossing two highly-improved breeds at starting there is better material to work on in establishing a fixed type of highly-improved animals. In some respects it may be so, but where both types or breeds in the cross are highly prepotent the trouble would be to get their conflicting good qualities to blend. A pure type of breed can never be produced by any system of crossing, which is a quick way of breaking up and destroying breeds. The question seems to be how far to break down the original or established types before commencing to re-establish a type or breed on new lines by in-breeding. It is much easier to breed up to uniformity of type when the males used have the fixed characteristics of any old-established breed, and are always of that one type or breed, and the females of less prepotency, if not of the same type as the sires. In the ordinary way of breeding, a half-bred or mongrel male would never be used, unless for some very special purpose, by a thoughtful person, as this is breeding backwards. The male should always, for the improvement of flocks generally, be as pure or strong in prepotency as can be had, since he has the power annually, during the greater part of life, of influencing a large number of progeny, as against one from a female annually. In ordinary breeding, using half-bred or mongrel sires is retrogression, breeding backwards, or a scattering to the winds of valuable good blood and allowing a lot of females to be unprofitable as far as maintaining or improving a breed is concerned.

There is always the drawback in what may be called artificial breeds that, having been produced by man's intelligence in working on natural principles, as soon as such breeds are neglected or mismanaged they more readily deteriorate and throw back to original unimproved types than stock that have been improved on natural breeds without any violent admixture of other blood. Crossing is the great cause of atavism. So soon as the influence of man in the compound type is removed they breed back to the mongrel mixtures from which they originally sprang. So much depends on the individualty of the breeder and his opportunities that attempts in originating and fixing new types are not likely to be often successful. Anyone can break down old-established improved breeds by crossing, but few men, comparatively speaking, are capable and have necessary opportunities for originating and fixing an improved breed from a mongrel mixture of pure breeds. Such a combination, if neglected or mismanaged, will quickly run out to an uneven, unmanageable combination of weeds.

A good deal of controversy takes place as to which sheep is the better drought resister, the Crossbred or the Merino. If anything, the majority of opinions favour the former, though if they have to be travelled, they do not equal the Merino, which can walk the head off any other breed. If water is scarce, Merinos probably drink less also, and do not swim in it, as some crosses do. However, with only a lick of the ground to live on, the Crossbred will hang out the longer, though possibly there will be dissentients on this question. A number of opinions by managers of big Riverina (N.S.W.) properties are interesting. They were collected just after a big drought. One says :—" The Crossbred sheep here did not get any scrub, and are now prime. The lambs are much hardier than Merinos, and look out for themselves earlier. I hope some day to see every sheep on the place Crossbred."

Another writes :—" I found the Crossbred weaners came through the drought quite as well, if not better, than the Merinos. The percentage of loss was slightly in their favour last year, and their condition at the end of the summer was better. Besides, I think they recover quicker. This year, they are in better condition at the present time than the Merinos. I have generally had them running together."

Another writes :—" In reply to your inquiry as to how the Crossbreds stood the drought as compared with the Merinos, I may state that where they have been running with Merinos of the same age they have kept their condition better throughout the recent dry time, and that, although this year has been an exceptionally hard one, there has been no loss among them, except from natural causes."

Another says :—" Our Crossbred 2-tooths stood the drought much better than our Merinos of the same age. I have seen them tested several times in former years, and have always found the young Crossbreds are hardier sheep than Merinos. We have never had Crossbreds over two years old here, so I could not give an opinion as to how they would stand hardship when full grown."

Finally, the manager of a property where about 20,000 ewes are annually put to Lincoln rams, says :—" I find that the Crossbreds stand the drought as well, if not better, than Merinos, and come out in better order at the end if the water is plentiful. I think, perhaps, that the Merino may have—but I am not sure—the best of it if the water is distant ; but I know that the Crossbred will do better on apparently as little feed as the Merino, for the reason, I think, that the Crossbred is not so particular as to quality, and forages better for his food."

Having discussed fairly fully the question of cross-breeding, a reference may now be made to its connection with agriculture on farms. Sheep are the cheapest, the best, and the most efficient "agricultural implements" a man can have on his farm, as they work of their own free will, and pay for being allowed to do so. They clean up the fallows and weeds, and fertilise the land at the rate of about 3 lbs. of liquid and solid manure a day, thus adding required humus to the soil. In combination with a proper system of crop rotation, the depasturing of sheep will bring so-called worked-out lands to a high state of fertility. The practice of alternating wheat crops with bare fallow exhausts the soil of humus. A year in grass greatly improves the rotation, but a leguminous crop is also needed in the ideal rotation. The returns from bare fallow do not compare favourably with those from a legume and cereal crop rotation. A rotation practised in South Australia is peas, wheat, barley, or oats, and two years in grass. The barley or oat stubble is harrowed or disced, and a little oats or barley broadcasted over it. This provides early sheep feed. The wheat stubbles require ploughing for the barley or oats, and are worked to a good tilth. This rotation gives three cash crops—peas, wheat, and barley—and two feed crops in five years. Farm paddocks should be subdivided into fields proportionate to the size of the flock, so that they can be fed down in a few weeks in rotation, and growing crops can be fed down when required. Sheep will keep the weeds in check. It is a much happier and more economical plan to let the weeds walk to market as mutton then to chase them round the paddock with a cultivator. (For further details of forage crops see end of next chapter.)

Before putting sheep on to a crop they should be kept for a couple of days on low diet to give them a good appetite. Good judgment must be used, however, and they must not be actually starved or they will eat too ravenously and become "blown." If put on with a full stomach they are fastidious and eat out all the sweet patches, leaving the rank growths; a well-fed off crop has the appearance of having been clipped with a pair of scissors. If the sheep hang too much to one part of the crop, a scarecrow should be erected in order to move them on to the neglected parts. Dogs in no case should be used, as they make the sheep rush about too much, unsettling them and causing a lot of plants to be unnecessarily destroyed. A crop carefully fed off in a drought and carefully harrowed afterwards will more than pay for any trouble taken. The feeding off strengthens the plant, and the harrowing forms a surface mulch at a time when every drop of moisture is of great importance.

CHAPTER XII.

FAT LAMB RAISING.

General Advice on the Care of the Flock—Which is the Best Cross ?—Merinos v. Half-breds or Three-quarter-breds—Qualifications of Various Crosses —Results of Lamb-breeding Trials—The Down Breeds—Use Good Rams — Marking Lambs — Best Type of Country for Lamb-breeding — Importance of Pasture—Condition of the Ewes—Classing and Mating—Weight of Lambs—Fecundity of Ewes—Growing Special Forage Crops—Rape and Mustard—Peas and Oats.

Lamb raising for export is a branch of sheep farming in which the holder of small areas can successfully figure. Of course it must be understood that in a way it is decidedly a science, and no man who goes in for it in a haphazard, unsystematic manner can expect to achieve very great success. The subject follows naturally on the last chapter, viz., Cross-breeding, as very few lambs are exported that are not crossbred. It may seem, therefore, that occasionally we are reverting to topics that have already been dealt with, but the two subjects are so intertwined that it is very difficult to actually separate and treat them under two distinct headings.

The first point that will have to be attended to is the condition of the farm fences. To make a thoroughly satisfactory fence the post should carry 8 wires, and these should be kept well strained up, especially those near the bottom. The lowest wire should not be more than 2 inches off the ground level. This involves a certain outlay, but it is an expense that must be faced by everyone who intends breeding crossbred lambs for export. The introduction of crossbreds on to a poorly fenced farm means endless worry while the crops are growing, and will more than likely lead to trouble with neighbouring landholders.

Some very valuable advice on the subject under discussion was given in a recent address by Mr. W. J. Colebatch, Principal of the Roseworthy Agricultural College, South Australia. He said :—" It is important to restrict the number of ewes, so that all the lambs can be kept going without check from the day they are dropped till they are in the saleyard. Checked lambs are always the cull lambs, and unless a farmer is fortunate in having a crop of kale or forage available, he will probably find it a difficult matter to top up reject lambs before the ensuing autumn. It does happen occasionally that farmers make more on their culls than they do on their early lambs, but this does not affect the position, and should not influence the breeder any more than a phenomenal crop on autumn-ploughed land would influence a farmer against early and well-worked fallow.

" The first operation in the sheep year is tne culling of the flock immediately prior to shearing. In a lamb-breeding flock this is a relatively simple matter. All ewes with broken or weak mouths, defective udders or teats, should be cast, and ewes known to be shy breeders, even though in consequence of their sterility they present a particularly attractive appearance, should be relentlessly discarded. For lamb breeding a four-course rotation is better than a five ; but when a good even line of ewes has been secured, there is a very strong temptation to hold on to them another year ; and if their mouths were sound, I believe I would prefer to do so. The reason for advocating a shorter rotation under ordinary circumstances is that the broken-mouthed ewe is unable to do her lamb well enough, and ultimately she fetches less money in the fat market. After drafting out the ewes, the hoggets are gone over carefully to see that they are all sound before being admitted to the breeding flock. It is at this time that the advantage of breeding ewe hoggets on the farm is felt, as they are more even in type and more contented than newly purchased additions. The system, however, involves a reduction of the lamb-producing capacity of the farm by 25 per cent., so that on small holdings, or even on fairly large estates in districts where the right class of sheep is readily procurable as hoggets, the ewe flock would probably consist entirely of breeding stock. Some breeders adhere to the policy of buying up draft station ewes, which they dispose of again after a lamb has been taken from them. They claim that the older ewe is a more reliable breeder, and that parturition is attended with a lower percentage of deaths. This system, however, does not make for uniformity of type and evenness of quality, two factors which are of the first importance in the fat lamb trade. For the local market it may be well enough if sufficient care be shown in the selection of the ewes ; but for export lambs it is better to buy young ewes of a suitable class, and to stick as closely to the type as possible when drafting out or adding to the flock.

" In order to obtain the best percentage of lambs, the ewes should be mated on good feed, and the number of ewes to the ram should be under rather than over 50. It is foolish to economise in rams when breeding fat lambs. The presence of several rams in the one field means a higher percentage of lambs, and it is a good plan to hold back one or two and introduce them to the flock a fortnight or three weeks later. One or two vigorous ram hoggets are sometimes saved to catch up any missed ewes after the other rams have been withdrawn. By keeping a careful watch to see whether the rams are working, and by adopting certain stimulative measures, such as close yarding overnight, or the temporary withdrawal of the rams, it should be possible to raise the lambing percentage on small holdings to over 90, and where English rams are used on half-bred ewes the lambing should approximate to 100 per cent. Lambing ewes require to be visited at least twice a day, and oftener if possible, particularly when there are many hoggets in the flock, and when large-headed rams have been used. Ewes that require assistance should receive careful handling and good nursing. With a little experience, cases of difficult birth are not usually hard to remedy ; but unless the ewe be tenderly dealt with in the process, there is grave risk of her succumbing to the treatment.

"The use of carbolised oil as a lubricant and a little brandy or sweet spirits of nitre as a stimulant when necessary will prove helpful, and by raising up the hindquarters of the ewe so that the expulsive force of the uterine contractions is to some extent nullified, the task of the shepherd is simplified. In all instances in which prostration occurs—and this is usually so when a dead lamb has to be removed piecemeal—the ewe should be placed on a bed of clean straw in a sheltered corner of the field, or better still, under the lee of a straw stack, and given regular attention. Until recent years sheep have not been sufficiently valuable to induce farmers to adopt such careful practices as I have advocated ; but I believe the day is fast approaching when farmers will realise the necessity of bestowing upon their breeding ewes the same watchful care and treatment which they vouchsafe to their brood mares and springing heifers. Lambing ewes should be undisturbed, except for the shepherd's visits, and they soon become accustomed to his presence. No dog should be allowed near the field, and as far as possible strangers should be prevented from intruding. At every opportunity ewes that have lost lambs should have motherless lambs worked on to them, and it is important to see that the whole of the lambs are properly mothered night and morning. When a lambed ewe is not available, the motherless lamb should be hand-reared in a sheltered yard. It is only by imitating these practices, which experience has shown to be profitable in other parts, that we can hope to obtain a really high lambing percentage.

"Ewes should be lambed on green pastures, so that their udders may be kept well supplied. Whilst rearing their lambs the feed cannot be too forcing. Early sown rape and mustard, kale, stubble pastures, rank cereal crops, or lucerne paddocks will serve to hasten the lambs along during the winter and early spring, and the later lambings can be finished on peas, kale, or lucerne. For export, lambs should dress from 30 lbs. to 37 lbs., the lighter carcases being graded as first-class, while those going 40 lbs. or over fetch a lower price per lb. The ideal freezer is a prime lamb scaling 35 lbs. to 36 lbs. The London market affords no encouragement to the export of lean lambs. They must be well covered on the back and ribs, tightly packed in the legs, and the whole carcase should be plump and well rounded.

" A great trouble that besets the fat lamb breeder in some districts is an obscure disease that affects ewes shortly before lambing. The animals attacked are always in good condition, and commonly, though not invariably, carry twin lambs. The first indications of disease are dulness, impaired appetite, and a disposition to separate from the remainder of the flock. They stand in a half-dazed condition, and permit anyone to go right up to them without attempting to move. If forced to move, they do so very slowly and aimlessly. Later on they pass into a state of semi-consciousness, lose the sight of both eyes, and remain on their feet, grinding their teeth and occasionally staggering along a few paces, till they ultimately fall and die. The disease runs its course in about a week, and although not always attended by fatal consequences, the prognosis is always unfavourable. Another feature of the disease is that the wool separates from the skin in the early stages. The complaint was investigated some years ago by the New Zealand Department of Veterinary Science, and it was found on post-mortem examination that the liver was much enlarged, and contained an abnormal quantity of fat, which rendered it very friable. The kidney and even the heart muscles were similarly affected, but the uterus and its contents were found to be perfectly healthy. The conclusion arrived at was that the disease was due to a plethoric condition, leading to fatty infiltration of the organs, and the superabundance of fat was attributed to lack of exercise.

" The theory is that ewes provided with ample pasturage can obtain a plentiful supply of food without travelling any distance, and as the period of gestation draws to a close, the ewes become less and less inclined to take exercise. There appears to be no suspicion of contagion, and it seems to me highly probable that dietetic influences are really the cause of the trouble. On the first appearance of the malady the ewes should be placed on bare pasture, so as to compel them to move about in search of food. During the last month of pregnancy it is a wise precaution to keep the flock on short feed, and when the opportunity arises they should be given an occasional run on a grass paddock or an early sown cereal crop. In every way possible the ewes should be encouraged to exercise their muscles, and thus use up the fat that accumulates and interferes with the functions of the internal organs. Personally, I have little faith in the medicine chest for diseases of this kind. If the disease can be detected early, it may be well to deplete the system by bleeding and the administration of large doses of laxative medicine. But the employment of special drugs, such as liver stimulants, is of no avail."

The question of what breed or cross to use is a difficult one; there are so many factors of climate, environment, etc., that must influence the choice that it is impossible to say here what cross will give the best results. The grower can only keep his eyes and ears open, utilise his common sense, and profit by the experience of men who have achieved success at the business in his own district.

Pure Merinos may be used, but at the same time it may be taken as fairly certain that under most conditions, farmers will do better with half-bred or three-quarter-bred ewes than with Merino. Quite possibly in Australia it may be difficult to go into the market and buy, say, 500 half-bred 2-tooth ewes all ready to go on the land, in which case it is best to pick up a line of good big-framed Merino ewes, and with them use a Longwool ram, Lincoln, English Leicester or Border Leicester. Where climate and soil are suitable, and the area is sufficient, Merinos will prove alright, but they will not do on too small a run. Any area below 1000 acres is not much use for raising general purpose Merino lambs; they will not grow quickly or big enough, no matter how abundant the feed. Merinos are roamers, and object to close feeding. Again, they will give a smaller percentage of lambs than the half-bred ewes, and another strong point in favour of the latter is that their lambs reach maturity earlier. The drop occurs at the time when, under normal conditions, the feed begins to come along, and the stock increase as the feed develops. Then, if managed well, the lambs can be sent away as the feed dries off, and there remain only the ewes to carry on. Merino lambs are just as sweet as crossbred, but they are a different colour, and do not sell so well. Australian half or three-quarter breds, when the lambs get home, compare with those bred in the Old Country, or those shipped from New Zealand.

For prime lambs for export, the grower cannot go far wrong in working along the following lines. Having obtained big-framed young Merino ewes, and put them to a Lincoln, Border Leicester or English Leicester ram, cross the half-bred ewe progeny again with a Longwool ram, not necessarily, but preferably, of the same breed as used in the first cross. Having reached the three-quarter-bred stage, the breeder can now use, say, the Southdown or Suffolk ram, because he has built up the frame to give him the right conformation with weight and early maturity—36 to 38 lbs. Again, the comeback gives good results. If a large-framed Merino, with a good square frame, with good bone and quite free from wrinkles, is put to first or second cross—Lincoln or Leicester cross—ewes, satisfactory results will be obtained, and on reasonably good country every lamb will fatten. If heavy lambs are wanted, three-quarter-bred Lincoln or Leicester ewes can be put to large-framed, square Merino rams, with a certainty of producing a marketable article. Or else we can come back to the Merino by using a Corriedale ram as the first step back, and on the progeny a good robust, plain-bodied ram, let us say, of the Wanganella type. The Corriedale makes the return less sudden, and leans towards the sheep it is desired to come back to. Of course, many of the first stage lambs will incline to their grandsire on the dam's side, but these are culled out of the ewe lambs, and not mated with the Merino. The great advantage of comebacks is that any lambs that do not fatten are easily marketable stores that can be used on any country.

The Border Leicester, English Leicester and Lincoln all give very good results under different conditions, and, personally speaking, we should place them in that order of preference, although we are aware that in a matter such as this, into which personal prejudice enters so largely, many readers will disagree with us. The Border Leicester on the Merino ewe gives better results than the Lincoln where the country is rougher, though where the pasture is unsound the Romney ram can well be used, because the Romney cross is less liable to lungworm and footrot. The carcase is not so shapely when dressed as either the Lincoln or the Leicester, and not so profitable on good pasture. In semi-dry areas, the Lincoln on Merino produces a neat, compact, well-woolled, good-constitutioned sheep, less liable to lungworm than the pure-bred Lincoln. A Southdown ram on this cross should produce a good lamb for the London market.

With regard to the Border Leicester, it is doubtful whether any other of the Longwools can approach him as a lamb-getter. In addition to being of a more thrifty nature, and better able to withstand hardships likely to be met with in varying seasons in Australia, and being of an active nature, he will thrive where, say, the English Leicester would find difficulty in holding his own, and this is one reason for the preference above stated. Border Leicester lambs, owing to the ram being more compact, if less showy, are all given to early maturing. They seem to jump right ahead from the beginning, a great point in their favour in the early summer, when a dry spell may set in or feed go off. It sometimes means the difference between getting a fair return and a loss on a draft of lambs. Yet over this question of Border Leicesters v. English

Leicesters, the "doctors" differ a great deal. Take the opinion of Professor Lowrie, who some years ago, when Director of Agriculture in South Australia, strongly advised the use of the English Leicester ram on the Merino ewe as a beginning. The best of the ewe lambs which resulted should be kept, he said, and upon these should be put either the Shropshire, Southdown, or Dorset Horn rams. The Leicester-Merino ewes made prolific mothers—under average conditions and with proper care a percentage of between 130 and 140 could be confidently expected—and the colour of the meat of the lambs secured from them with the aid of the short-woolled ram would leave absolutely nothing to be desired. That was a most important consideration in the sale of the carcases in England. He was satisfied that by adopting the course outlined they could raise lambs even superior to those grown in Canterbury (N.Z.). The Southdown ram, in his opinion, was preferable to the Shropshire, but the resultant lambs took a fortnight longer to come to the same condition.

On another occasion, Prof. Lowrie, addressing a meeting of farmers, advised them to secure some large-framed, bold Merino ewes—the bigger the better—having good backs, and use on them English Leicester rams. Unless they had courage, the next step would land them in trouble. When drafting their lambs for market they must reserve, say, 60 per cent. of the very best of the ewe lambs for breeding purposes. Some of them would probably want to send the best to market and keep the late comers and the hard doers for breeding. If they did that they would inevitably fail. Only the most promising of the ewe lambs should be retained for breeding, and upon those they should employ a short-woolled ram—Shropshire, Southdown, or Dorset Horn—according to the class of country and the conditions under which they were working, bearing in mind always the need for ensuring early maturity. It was of vital importance that every hoof of those three-part-bred lambs should be sold, and that they should not be used for breeding. Unfortunately in some instances, through improper breeding, the true characteristics of the Shropshire had been sacrificed. The best sires for the production of fat lambs were those very sheep sometimes that were discounted at the shows. A first-class Shropshire ram, when handled on the back, should be like a feather bed. The blue-skinned, hard kind of animal should be eschewed, for he would be no good for their purpose. There had undoubtedly been too much Merino judging of English breeds. The first consideration in those breeds meant to get fat lambs was how they handled on their backs, not how they were covered at the points with wool. Sometimes it might suit them to use the Longwoolled ram again on the half-bred ewes. If they did that they would get very creditable wool and nice-framed lambs. The best lambs he had reared were from half-bred English Leicester ewes sired by Border Leicester rams. He then used Southdown rams on the ewes, and obtained some of the finest lambs he had raised. Since the time of the above expression of opinion, given some six or seven years ago, Shropshires have very largely gone out of favour, and have been supplanted by Southdowns, especially in New Zealand.

Turning now to some results of lamb-breeding trials on experimental farms, we get the following from the Werribee State Farm, Victoria. An even line of first-class Lincoln-Merino ewes were mated with the rams of various kinds, and fifteen wether lambs at a maximum age of seventeen weeks, a fair average quality of the total drop in each case, were submitted to the selling, slaughtering, and weighing tests. The results were :—

Ram Used.	Auction Price.		Average Live Weight.	Average Carcase Weight.	Average Weight Pelts.	Weight Offal.
	s.	d.	lbs.	lbs.	lbs.	lbs.
Border Leicester	16	2	86.8	44.1	9.2	33.5
Dorset Horn ..	14	11	85.4	43.1	8.8	33.5
English Leicester	14	1	77.0	37.0	10.2	29.8
Lincoln	14	0	80.0	39.0	11.4	29.6
Southdown ..	14	0	74.1	36.13	10.6	27.42
Shropshire ..	13	10	71.5	34.7	10.33	26.47
Average ..	14	6	78.68	39.0	10.08	30.05

Out of the fifteen lambs submitted of each cross, fifteen Border Leicesters were graded as first-class, fourteen Dorset Horns, and eleven Shropshires, while the other lambs were not graded. In Border Leicesters the maximum weight of carcase was 58 lbs., the minimum 37 lbs. ; with Dorset Horns the figures were 51 and 35 ; English Leicesters, 45 and 31 ; Lincolns, 50 and 29 ; Southdowns, 44 and 27 ; Shropshires, 41 and 24½. The prices, it will be noticed, are to a certain extent in proportion to the weights. While Southdowns and Shropshires occupy the bottom of the list, it will be noticed that they have "died" more economically, and it must be remembered that quality of meat does not count in this case.

Again, the Bathurst Experimental Farm, N.S.W., recently sent a consignment of crossbred lambs to the Homebush saleyards, near Sydney. They were second cross, and good prices were obtained, the sales being in the nature of a test to ascertain the comparative value of the various Down breeds mated with Longwool-Merino ewes. Each cross was penned and sold separately, and comprised the entire drop from the respective groups of ewes. The lambs on the average were five months old, and came forward in excellent condition. It will be noted from the following table that the early maturing character of the Border Leicester was transmitted to the progeny of each cross in which it appeared, and made top value in each group of the Down breeds. The ewes by which these lambs were reared averaged 10 lbs. of wool, which realised 1s. 3d. per lb. at recent Sydney sales. All the lambs were sold in the wool, and the following were the prices realised at auction :—

Southdown x Lincoln-Merino (8)	20/11
Southdown x Leicester-Merino (8)	22/9
Southdown x Border Leicester-Merino (14)	23/2
Shropshire x Lincoln-Merino (14)	19/11
Shropshire x Leicester-Merino (6)	21/5
Shropshire x Border Leicester-Merino (10)	22/4
Dorset Horn x Lincoln-Merino (12)	21/11
Dorset Horn x Leicester-Merino (7)	21/-
Dorset Horn x Border Leicester-Merino (5)	23/-

One more instance will be sufficient. Two or three years ago several consignments bred at the New South Wales Government Experiment Farms were sent to Homebush for sale, comprising crosses by Southdown, Shropshire, and Dorset Horn rams on half-bred ewes. For each cross the dams were kept under entirely the same conditions; in fact they were allowed to run in the same paddock together, so that the results may be taken to indicate the relative merits of the breeds employed. All consignments were in equal condition. The following particulars show the average weight of the lambs of each draft on leaving the farms, and on their arrival in Sydney, as well as the prices obtained for them :—

WAGGA.

Southdown, with Lincoln-Merino.—Farm weight, 82 lbs.; weight on arrival at Flemington, 76½ lbs.; price realised, 25s.
Southdown, with Leicester-Merino—81¼ lbs., 77 lbs., 24s. 10d.
Southdown, with Border Leicester-Merino.—82¾ lbs., 76 lbs., 24s. 7d.
Shropshire, with Lincoln-Merino.—76¼ lbs., 72 lbs., 24s. 4d.
Shropshire, with Leicester-Merino.—77½ lbs., 72 lbs., 22s. 6d.
Shropshire, with Border Leicester-Merino.—82¾ lbs., 78 lbs., 24s. 9d.
Dorset Horn, with Lincoln-Merino.—89¼ lbs., 83 lbs., 26s. 3d.
Dorset Horn, with Leicester-Merino.—88 lbs., 82 lbs., 26s. 4d.
Dorset Horn, with Border Leicester-Merino.—89½ lbs., 87 lbs., 26s. 3d.
Dorset Horn, with Devon-Merino.—83 lbs., 77 lbs., 25s. 1d.

COWRA.

Southdown, with Lincoln-Merino.—79 lbs., 72 lbs., 21s. 1d.
Southdown, with Leicester-Merino.—82 lbs., 74 lbs., 22s. 9d.
Southdown, with Border Leicester-Merino.—83 lbs., 76 lbs., 23s.
Shropshire, with Lincoln-Merino.—79 lbs., 75 lbs., 23s. 11d.
Shropshire, with Leicester-Merino.—80 lbs., 71 lbs., 23s. 7d.
Shropshire, with Border Leicester-Merino.—85 lbs., 76 lbs., 23s. 11d.
Dorset Horn, with Lincoln-Merino.—81 lbs., 73 lbs., 23s. 1d.
Dorset Horn, with Leicester-Merino.—77 lbs., 71 lbs., 23s. 6d.
Dorset Horn, with Border Leicester-Merino.—81 lbs., 73 lbs., 23s. 6d.

BATHURST.

Southdown, with Lincoln-Merino.—74¼ lbs., 70½ lbs., 25s.
Southdown, with Leicester-Merino.—75½ lbs., 71½ lbs., 26s.
Southdown, with Border Leicester-Merino.—79½ lbs., 69¼ lbs., 28s. 6d.
Shropshire, with Lincoln-Merino.—79½ lbs., 70¾ lbs., 26s. 2d.
Shropshire, with Leicester-Merino.—81½ lbs., 72¾ lbs., 27s. 10d.
Shropshire, with Border Leicester-Merino.—81 lbs., 70½ lbs., 26s. 7d.
Dorset Horn, with Lincoln-Merino.—82¾ lbs., 75¼ lbs., 27s. 4d.
Dorset Horn, with Leicester-Merino.—81¼ lbs., 72½ lbs., 25s. 11d.
Dorset Horn, with Border Leicester-Merino.—80½ lbs., 73¾ lbs., 28s.

COWRA.

Southdown, with Lincoln-Merino.—62 lbs., 55 lbs., 20s. 3d.
Southdown, with Leicester-Merino.—63 lbs., 55 lbs., 20s. 3d.
Southdown, with Border Leicester-Merino.—70¾ lbs., 62¼ lbs., 23s. 5d.
Shropshire, with Lincoln-Merino.—69¾ lbs., 61 lbs., 22s. 7d.
Shropshire, with Leicester-Merino.—67 lbs., 57¼ lbs., 21s. 1d.
Shropshire, with Border Leicester-Merino.—67 lbs., 60 lbs., 22s. 5d.
Dorset Horn, with Lincoln-Merino.—78¼ lbs., 69¼ lbs., 25s.
Dorset Horn, with Leicester-Merino.—66 lbs., 59½ lbs., 25s.
Dorset Horn, with Border Leicester-Merino.—70½ lbs., 61¼ lbs., 25s.

It will be seen, then, from the above, that there is much to be said for each of the Longwool breeds, but on the figures the Border Leicester would appear to occupy the premier position. However, the choice of which to use must be left largely to the breeder's own judgment, exercising his powers of observation and bearing in mind his own particular conditions of soil and climate.

Coming to the Shortwool or Down breeds, we place the Southdown or Suffolk first, although with regard to the latter there is as yet very little scope in Australia for the purchase of rams. The Southdown cross is an ideal carcase for export, and the rams are very prolific. The lambs are very sprightly, but they will not stand a check from want of feed. To avoid this it is better to have a limited number, according to the size of the holding, and ensure them having sufficient feed to finish them in the early part of the season. They are the wrong sort to carry over when they are stinted in feed at the start. They never seem to make any advance, either as store lambs, hoggets, or ewes for breeding purposes. If feed is available they fatten very quickly, and there is not much fear of them being held over. As lambs for export—where they have been treated right—they are hard to equal, with their fine bone and not excessive quantity of fat. They attract notice at once as a carcase, and have a better chance of being lambed alive in higher percentages than the progeny of a Shropshire ram. The Southdown has a contented disposition, which has a great deal to do with the thrifty disposition of the lambs, making them good "doers." They are hardy equally under drought, excessive wet or sparse feed conditions, and are most prepotent, half-bred Southdowns having very largely the characteristics of their Southdown sire or dam. Moreover, they grow a fine wool, that can, with care in breeding, in selection, and in mating of dams and sires, be increased in density and fineness of quality, and therefore in per lb. value, without in the least degree injuring the size or quality of the carcase. Briefly, the Southdown's strongest points, apart from its excellent mutton qualities, are its great hardiness and fecundity, and these factors, no doubt, are primarily responsible for its displacement of the Shropshire.

The Suffolk also possesses the same characteristics in a marked degree, as was shown by a series of experiments carried out at the Government Research Farm, Werribee, Victoria, recently. The object was (1) to ascertain the comparative market values of the various crosses ; (2) to compare the values of the fleece of each cross at shearing ; and (3) to test the prepotency of the rams used.

Lincoln Merino first cross ewes were used, and were divided into six sections, particular care being taken to preserve uniformity throughout. The following rams were joined with the ewes :—Lincoln, Border Leicester, Suffolk, Dorset Horn, Shropshire, and Southdown. Forty ewes were mated in each section, and all were branded and tagged. The sheep were placed in equal and separate paddocks, and to secure equality of feeding the sheep were moved from paddock to paddock in regular rotation during the period of mating. After the rams were withdrawn the ewes were pastured together until a fortnight before lambing, when they were again placed in separate paddocks.

The pure-bred stud from which the Suffolk ram was drawn had but recently been imported from England, and it was therefore hardly to be expected that the lambing record would be equal to that usually shown by this prolific breed, but though the lambs were not dropped until the end of July the lambs at fourteen to fifteen weeks were as heavy as the heaviest of the other crosses at seventeen weeks, which speaks volumes in favour of this cross in respect to their early maturing and rapid-growing qualities.

At approximately seventeen weeks the wether lambs of each of these crosses were weaned and sold in the wool at the saleyards in separate and presentable lots to create genuine and comparative competition among buyers for slaughtering as butchers' supplies or freezing for export. The table of statistics shows that the Suffolk cross made the top price at auction, viz., 26s. In average live weight they were second—90.5 lbs.; in maximum weight of carcase, first—60 lbs. ; first also in minimum weight—39 lbs., and first in average weight—47 lbs. ; and they also showed the least percentage of offal loss, viz., 37.0.

To ascertain the true value of the wool the ewe lambs were retained three weeks after the sale of the wethers and shorn, and the fleeces classed and valued. The quality of the Suffolk cross wool was 56 in Bradford counts, and in the value per lamb came second, viz., 2s. 8.48d., being beaten only by the Lincoln, which averaged 3s. 1.63d.

For the Shropshire cross most favourable conditions are required, necessitating a good class of Longwool cross ewes as mothers and good rich pastures, preferably of English grasses. If the lambs receive a check, and they lose their chance of going off fat, the grower is likely to have them on his hands, and the chances of profit then remaining are fat wethers and a clip of wool, but the strongest advocates of the Shropshire cross as fat lambs would not go as far as to say that it is the cross to make the best fat wether or cut the best clip of wool. Moreover, the requirements of the lamb trade do not end with the fat lamb in his pasture. The matter of transit to freezing works has a tremendous bearing on the question, in no case more so than with the Shropshire and Southdown crosses. Lambs must be frozen in their prime, but a long journey on the hoof to the railway, a delay waiting for stock trucks, a rough tedious journey by train, and bad facilities at the unloading end, all combine to discount the skill, care, and expense incurred by the grower in producing the class of lamb the freezing companies require. It seems to the writer that it is just as reasonable to advise in a wholesale manner lamb breeders in some parts of Australia to go in for the Shropshire cross as to recommend farmers on the rich flats of Canterbury or Hawke's Bay to go in for Merinos. The Shropshire cross, reared on rich English grasses, rape, or turnips, is quite a different proposition to when it is dependent upon the natural grasses of Australia. On second-rate country Shropshires should be left strictly alone.

The Dorset Horn can hardly be strongly recommended for getting lambs for export. The lambs do not mature early enough, and taken at export weights, have not finished growing. We get a large immature lamb, showing too much bone for its weight at that age, too leggy, and too much length over all to suit the requirements of the export trade

Leaving the question of choice of breed, we will now turn to the actual management and methods that should be adopted in lamb raising for export. To be among the top prices the owner should observe the following primary rules :—Select the breed of sheep best adapted to his soil and climate, and start with the best money can buy, paying more attention to quality than numbers ; it pays better to keep one good sheep than two bad ones. If pure breeding is to be the aim the ram should always have less faults than the ewe, but the less faults either have the better. If cross-breeding is to be adopted, the ram must still be as faultless as it is possible to get him. There should be a strong family likeness in all lambs, especially if they are crossbred, as the whole mob is valued by the ill-grown ones. Aim always to produce the best. See that the sheep are not stinted in the way of food, although do not overdo it ; over-feeding is often more disastrous than a little under-feeding. The supply should be regular in quantity and quality. Cleanliness is as essential as feeding, and it takes less of the latter to keep them thriving than when they are allowed to live in filthy surroundings. Water must have the same attention as the food, plentiful and clean, and it should be accessible without having to resort to driving.

Lambs should be marked when five or six weeks old ; never later if it can be avoided, and great care should be taken. All instruments should be properly sterilised, including the human hands. Very often through lack of these precautions, numbers of lambs are killed, the value of which would go a long way towards purchasing a good line of ewes for future breedings. All the lamb troubles at this time, if analysed, will be found to have arisen from dirt ; all the losses we see from blood poisoning are brought about by want of forethought in not cleansing the ground and operating theatre before the work is started. Mild weather is of much consequence ; frosty nights are bad, and foggy weather is the best. Never mark after 3 or 4 p.m., and only enough should be yarded to get done by that time. The holder of a lamb requires to be just as expert as the operator, there being a right way and a wrong in this simple operation as in everything else. To catch a lamb the left arm should be placed around the lamb's neck and the right one passed underneath the abdomen, so that the hand can grasp the left flank ; then bend the knees so that the lamb's rump rests on them while the catcher grasps first the left hind leg and draws it up so that by bending the fore leg at the knee he can comfortably hold the two on the one side in one hand. He then repeats the movement with the right ones, and having done this, lifts the lamb up so that its whole spinal column rests against his middle chest. Next he gently rests the rump on the marking rail of the fence, which should be covered by a full-woolled skin turned woolly side down, thus acting as a cushion. In holding the lamb to the operator the hind legs should not be forced too wide apart, just wide enough to admit free scope for the operator's face, which should first be sterilised, especially if he has a beard or a moustache ; this is just as necessary as cleansing the hands. The holder must hold the lamb firm, using no violence, however, and after the operation should first hold the lamb out from him in a horizontal position, and then let all four legs go at once, so that the lamb falls squarely on his feet. Do not throw him down in a careless manner.

Briefly, the method of the lamb breeder is to select individuals showing as nearly as possible the qualities required, to attempt to balance defects in one parent with excellences in the other, and to mate together individuals which are neither very closely related nor entirely unrelated. Breed "in" to fix type; breed "out" to secure vigour; compromise.

Export lambs are mostly produced in warm districts, and cold is one of the most deteriorating influences against which the growing lambs have to contend. Indeed, the two essentials to healthy growth may be said to consist of green grass and warmth. Probably the amateur would be more baffled at choosing good lambing paddocks than any other task which might be set him in pastoral work. The land which on first sight might look eminently suitable for the purpose, the experienced sheep breeder would know to be quite otherwise, whilst country looking cold and bleak may be altogether suitable. Certain timbered land is not notorious for high percentages of lambs, simply because the grass growing there is coarse and innutritious. Treeless paddocks which appear shelterless and bleak enough to perish a bullock may in reality offer numbers of those little deep gullies and warm sheltering tussocks in which a lamb and no bigger creature can coil up to sleep in perfect protection from the bitter wind.

There are, of course, certain obvious distinctions between good lambing country and that which is bad. No one would think of turning lambing ewes into cold bare plains if he had lightly timbered healthy land on which he could run them until after the lambs were dropped. Neither would a normal station manager put his breeding flocks into poor stringy-bark ranges, with only coarse light grass and a one-sheep-to-three-acres carrying capacity, if he had stony rises on which he might run them. But apart from these wide differences, it is very frequently a matter of individual experience on each particular estate to tell which part of the run is best suited for breeding and rearing lambs. Not only have the physical characteristics to give the shelter which is so important, but the quality of the pasturage exercises a very potent influence on the milking propensities of the ewes, and without the milking propensities the maternal instincts fluctuate, so that a flock of ewes milking well will mother their lambs with the utmost diligence, even standing for hours over the corpse of one which may happen to die, whilst a flock of ewes, thin and with little milk, will be ready to walk away from young lambs, leaving them to fall ready victims to foxes, eagles, crows or starvation. Long grass provides one of the most valuable shelters, and deep gullies are similarly useful. Timber is mostly of use in that the lambs can coil up and sleep against the butts of the trees and under the logs. It takes very little observation to see that it is not so much the overhead protection they seek as breakwinds close to the ground. Probably stony rises country, with its steep banks, considerable boulders, good length of grass and dry surface to the ground, offers the best of all lamb country ; whilst unbroken plains, when they are bare of grass, as so many of them unfortunately often are, are the worst.

Seeing the importance of length of grass to lambs in cold weather, it should be a closely followed rule to stock lambing paddocks lightly before the ewes are put into them. At the same time, accumulations of old coarse grass are good neither for ewes nor for the lambs when the latter commence to nibble. It should consequently be a practice to burn patches of the lambing paddocks every autumn, if drought or some other circumstance does not cause them to be periodically eaten out fairly clean, at times not too close to the lambing ewes being put into them.

Whilst the moving about of flocks of sheep which include young lambs is attended with certain dangers and disadvantages, it sometimes happens that the paddocks in which the highest percentages are obtained up to the time of marking are not the most suitable to keep the lambs in up to the time of shearing, or of lifting for delivery to the exporters. As the lamb grows older, the question of shelter becomes less important, and the question of suitable pasturage more so. There is no room for doubt that for forcing lambs forward the richest pasturage is the best. The best wool-growing land will not grow the biggest sheep, and except under cultivation is rarely suited to the lamb export business. Young shoots of green are of more value to lambs just at the time of weaning, or shortly afterwards, than other forms of feed. Green shoots coming up through long dry grass, so often useful to other classes of stock, are not what lambs want, the older straws being more than the young and delicate digestions can assimilate. It is only necessary to see how perfectly bare lambs will nibble an isolated piece of green grass in a dry year to realise how they crave for the succulent young shoots. Even a few acres of irrigated natural grasses will serve to keep a flock of young weaners in good health in a comparatively large paddock during a dry season. Toward the end of a long summer, when all the natural moisture goes out of the grass, weaners, if not assisted in some such way as this, often get a setback from which they do not afterwards recover. It is probably not the lack of food that affects them so much as the effects of indigestible matter, which accumulates inside them and deranges their digestive systems. A small amount of green grass, unmixed with an old and coarse growth, will have the stimulating effect on the systems of the weaners which makes all the difference in the subsequent growth. The young lamb which is still with its mother, living partly on milk and commencing to nibble a little, is necessarily even more sensitive to the effects of indigestible matter, and is just as much in need of nourishing food. The importance of selecting the most nourishing paddocks for ewes and lambs when the latter begin to eat is consequently apparent.

A highly important factor both in rearing good lambs and in obtaining a large percentage of survivals is the condition of the ewes, not only at time of lambing and afterwards, but for several months. It is a well-established fact that a cow brought into good condition only immediately before calving will not milk as well as if she had not been allowed to lose condition. And the milking property is, of course, only one of the vital functions similarly affected. With the ewe the wool-growing capacity and the maternal instincts would fluctuate along lines parallel to the milk supply. The recently starved ewe would be less profitable, and the lamb would be less valuable and more likely to die because the ewe, besides having less milk, would not fight for her offspring to the same extent as if her constitution had been tuned to a higher tone. The problem of securing heavy crops of lambs as well as rearing sheep with good frames and sound constitutions resolves itself very much into the old story of light and heavy stocking.

One of the most important things to be guarded against is the use of cull rams, there being a special liability to this in the Lincoln and Leicester tribes. Animals are used largely that should not be rams, but wethers. In classing and mating avoid anything narrow or wrinkly, especially across the chest. There should be breadth everywhere, no drooping backs or bow legs, and the sheep for breeding should be surveyed just after the wool is taken off to see that it has not covered any flaws in the build of the animal. Class well for carcase, and sacrifice a little wool if the build is on right lines ; see that they walk without shuffling, for if they shuffle they will not breed mutton lambs.

Mating is a difficult problem to explain clearly, but there must be fixed in the mind an ideal that will stay there. We can only conjecture what the produce will be like, but the union of the two sexes should be made on the lines that the male will perpetuate his qualities to a greater extent than the female, be they good or bad. "Zig-zag" breeding is no good ; it demoralises a breeder. Stick to one type and breed for a name. The ewe for this purpose must be free from wrinkles, wide across the chest, wide behind, straight in the back and big in the stomach parts, a big udder and good long teats, plenty of room between the thighs to carry the milk bag, and udder free from wool ; wool on the udder prevents lambs from getting a proper drink.

Lamb raisers should weigh occasionally some of their lambs (10 per cent. of each flock) once or twice a month to see whether they are increasing or decreasing in live weight. This method has many advantages, it enables the farmer to see how they are progressing, and enables him to gauge when they will be fit for the works. If they are on good diet they should increase 5 to 6 lbs. per week, or an average of 4 lbs. per week—some lambs will increase more, and others less. In rough figures about half the live weight will be the weight of carcase, if they are fat. Every paddock should have a small yard in it so that any ailing from fly or other ills that lambflesh is heir to can be treated without taking them off their run, as lambs will always lose weight for a few days after being removed from the run they were dropped in. Lambs should never be put on to rich pasture immediately after marking —they are better on a low diet for at least a week so as to settle their nervous system. The shock to a male lamb is fairly severe, no matter how carefully the operation is performed.

Touching on the fecundity of ewes, an account of an interesting experiment was published some years ago by Sir Alexander Bell, at one time Geologist to the Dominion of Canada. This experiment was conducted on his farm in Nova Scotia, and for ten or twelve years he had been endeavouring to fix a breed of sheep having four or six milking teats and producing twin lambs at birth. He noticed that the proportion of sheep having four developed nipples was larger among twin-bearing ewes, and this started him on his quest for a correlation between the two. In a very few years he produced a strain of ewes which had, as a normal condition, four teats of nearly equal size, all yielding milk, by mating four-nippled ewes with four-nippled rams. By picking up ewes from neighbouring flocks with four well-developed, milk-yielding teats, the result was certainly hastened. Reversion seldom occurred ; and, the strain once established, it was found that these ewes were as fertile as ordinary sheep, if not more so ; and the twins, though small at birth, attained full size and weight by autumn. Five-nippled ewes began to appear among the flock, and six, seven, and even eight-nippled ewes were noticed. By selecting and mating to produce more than four nipples, the number of six-nippled ewes rose to about 25 per cent., then to 50 per cent., and in 1912 to 54 per cent. Nearly 60 per cent. of the lambs born in 1912 from three-year-old ewes were twins, and many ewes produced twins the first time. It was believed by the breeder that the six-nippled strain would eventually prove to be twin-bearing when of mature age, but whether this happened cannot be stated, as there is no available record of later results. He found that twin-bearing ewes were, on the average, heavier than other ewes, and on account of this culled out light ewes. To secure the greatest number of twins, the ewes were kept in prime physical condition at mating time. Two or three weeks after mating twin-bearing ewes often dropped off in condition suddenly. Sir Alexander Bell suggested that for twin-rearing it would be well in the spring to retain only those lambs that were under the average weight at birth, and in the autumn to select from those that had attained more than average weight.

Of course, an objection to the above system is that the four-nippled sheep selected for mating might easily be the sheep that should be culled on account of drawbacks or generally inferior quality. If four-nippled rams and ewes could be secured from the best sheep then all would be well. A New Zealand breeder has found it possible to increase the twin-bearing propensity in his flock by making it a firm rule, when annually putting young ewes into his breeding flock, never to put in the tops. The tops in a mob of young sheep are the single lambs, the twin lambs being, obviously, the smaller sheep. In selling his lambs he lets the tops go off as fats, and keeps the best of the others, because he knows that their lack of size is due to the fact that they were twin lambs. By putting these into his breeding ewes he intensifies the twin-bearing characteristics of his flock.

In conclusion, a brief reference may be made to the growing of special forage crops to meet the exigencies of the different seasons. Where the circumstances are favourable every man with sheep, to increase the carrying capacity and enable him to secure the most satisfactory results from his lambs, says Professor Lowrie, should plough his land, or if that should not be feasible, disc it, and drill in with a little manure about 2 lbs. of mustard and 4 or 5 lbs. of rape. Unless he can sow early, however, he had better leave the rape and mustard alone, and instead use peas. "Besides being a splendid fattening fodder, peas improve the land considerably. One reason they have not been sown more generally probably is the high cost of the seed ; yet when one realises the great benefits derived from them the price is insignificant. In the eyes of some farmers, it seems a lot to get back from grazing alone, and when 1 cwt. of super to the acre is added the outlay is like drawing teeth. It is a safe investment, however, therefore why hesitate ? A good mixture for feeding off or cutting with a view to future use consists of peas and oats. The seed would require to be sown pretty early. Peas and barley could be sown later, and the former would feed better for having the cereal with it." Lucerne is another fodder which can be cultivated to advantage in many localities where it is not now grown.

Peas have been found very successful in Tasmania, and when they have become low in price, it has been proved to pay better to harvest them by means of the stock than to thresh them. Take the following case in point. A farmer had a fairly large area sown to peas, and as the market promised nothing better than 3s. 6d. per bushel for machine-threshed delivered at the nearest port, he was induced to experiment on a paddock of eleven acres to ascertain whether it would not be more profitable to feed off with lambs than to harvest them in the usual way. It was estimated that the crop (a light one for the district) would yield 30 bushels to the acre if harvested in the usual manner, under modern methods, and machine-threshed. The cost of carrying out these operations in a favourable year, including bags and carting, would run into fully £2 10s. per acre. This is necessarily in this instance merely an estimate, but the figures can be readily checked by experienced, practical men, and will be found substantially correct. Thus the net return per acre would be £2 15s., made up as follows :—

30 bushels machine-threshed blue peas at 3s. 6d. ..	£5	5	0
Less cost of marketing	2	10	0
	£2	15	0

or a net return from the eleven acres of £30 5s.

The paddock was divided by netting into two lots, and 254 shorn lambs, consisting of about 25 per cent. fats and the balance forward and medium stores, valued for this particular purpose at 13s. per head, were placed on one lot at the end of January. When it was eaten out the whole area was thrown open, the peas, of course, being ripe. With the exception of about ten days, when they were taken off to clear up some pea stubble, the lambs had nothing but what these eleven acres supplied till 30th March, when they were taken off and sold on 2nd April. The result was as follows :—

Net return of 253 lambs (one dead)	£208	18	5
Value of lambs when placed on peas, *i.e.*, 254 at 13s. ..	165	2	0
Net profit	£43	16	5

This shows a profit in favour of the sheep of £13 1s. 5d., or £1 4s. 8d. per acre, independent of any consideration for the undoubted enrichment of the land which might fairly be credited to the sheep or allowed as a set-off for the benefit the lambs derived from the pea stubble during the ten days referred to. It was found that the sheep cleaned up every pea not trampled into the ground.

CHAPTER XIII.

MANAGEMENT OF A MERINO FLOCK.

MATING AND LAMBING.

Mating the Rams with the Ewes—Care of the Rams—Use Good Rams—Percentage of Rams—Rejoining Rams—Rigs—Yarding Ewes and Rams at Night—Breeding from Immature Ewes—Rams that Won't Work—Use of Drugs—Hand Serving—Stud Rams—Stud Ewes—Overworking Stud Rams—Treatment of In-lamb and Lambing Ewes—Spraying Ewes against Blowfly—General Notes on Lambing—Pasture—Water—Assistance to Ewes in Trouble—Ewes Slipping their Lambs—Lambing Ewes Cast—Pests at Lambing Time—Crows—Foxes—Fox-guard for Lambs.

A good manager of stock must be intelligent, observant, energetic and systematic. He should not only know how to breed the best, but must see that at every stage they are properly cared for. His intelligence and power of observation will qualify him to note the various characteristics of the land and climate, and to judge how to treat the former, as well as to decide on the class of stock best suited to the conditions. His energy and system will enable him to carry out satisfactorily what his intelligence and observation have suggested.

Now, in the management of a sheep flock, having obtained a satisfactory mob of ewes, his first consideration is the problem of mating. Few men, if any, are capable of selecting solely from appearance the actual best for breeding purposes. In selecting mutton or wool straight for the market thousands of men are expert, but it is quite a different thing to select the animals most likely to have progeny that will maintain and improve the commodity and transmit this property strongly to their descendants. This is more a question, however, of actual classing, which will be fully dealt with in a later chapter, as it is a big subject, and one of the most important the young sheep-man has to study.

What we want to deal with now is the actual mating of the rams with the ewes. The season for lambing, and therefore for mating, depends almost entirely on the district, and to some extent on the season. In a hot climate it is an advantage to shear the rams some three months before mating. In any case, before joining always see the ram's toes are trimmed, keep their horns sawn off to about the first curl, and if at all woolly crutch round the pizzle well, and shear away all the wool round the eyes, horns and back of the head.

The feet are a most important consideration, and if any lame rams are seen they should be most carefully examined, as footrot may be present. In wet seasons or on country where footrot is likely to develop the rams should be walked through quicklime to harden their feet and dry up any scald that may have developed. An application of kerosene by standing the ram in a trough holding sufficient to cover the feet has provided very useful treatment. A lame ram is a useless ram, so the feet must be carefully looked after. Do not pamper even valuable rams by too much housing and rugging, except in very rough or wet weather. The ram got up for show often gives very poor results when turned out with ewes.

When grass is seeding the rams must be carefully guarded, and if seed is very bad they should be kept out of it at any cost, as seeded rams will not work properly, if at all.

The careful sheep-man will look with suspicion on the station dogs, and if loose animals are about poison should be laid in the ram paddocks. Of all breeds the Scotch terrier is the worst. He is a terror amongst rams, and should not be kept anywhere near valuable sheep.

Rams as a rule are never better cared for than during the joining season, but when not in use do not always get the care and attention they should. The average death rate in rams is, generally speaking, far greater than it should be, and the percentage of efficient rams at the joining season, could, as a rule, be very greatly increased by regular and careful inspection. On a large run it would well repay the owner to make the care of rams the work of one responsible person. When they are removed from the ewes they should be yarded and examined individually, to see that no damage has been done while at work. Feet will perhaps need trimming, and every part of the ram should be examined to see that it is free from maggots. Round the base of the horns very careful inspection is necessary, and a dressing should be applied. Rams will fight at all seasons of the year, and the broken places are very apt to get blown if not dressed in time. A mixture of dip powder and castor oil is a good dressing for head cuts ; Stockholm tar is also a useful preventive. But this is a digression from the subject of mating.

First and foremost use good rams. No breeder can raise the level of his flock sheep above the standard of the rams he uses. Good ewes mated with rams defectively bred will throw lambs inferior to themselves, but the progeny of indifferent ewes that are mated with superior rams will be of a better type than their mothers. Thus the folly of using ill-bred rams of a low grade could not be more clearly demonstrated. No money is so advantageously expended as that used in the purchase of high-class rams, and so quickly repaid. The greatest mistake is to keep on buying rams from different breeders, and getting all sorts of types; the rams cost the same, and the wool is of all types and uneven, and brings less money. Get the sheep big-bodied, broad on the back, wide between the legs, high off the ground, square with plenty of depth, good clean faces, no wool over the eyes, and standing square on their feet. Avoid fads. A flock ram with a black toe or a streak in his horn is a better ram than one with faulty wool without the black marks.

Avoid crooked legs and ill-shaped, thin horns—which denote poor constitution—and bad feet. A very expert Australian station manager, with many years' experience, says:—"It is imperative that active, virile rams be used to assure a satisfactory return of lambs. Choose, therefore, rams with thick, well-shaped horns, with good bone and even quality of wool, and a bright pink-coloured skin which indicates the full-blooded, robust constitution required to secure the best results. Remember, too, that as a rule, the whiter the wool, the more vigorous the ram. Avoid body wrinkles on account of difficulty of shearing, and especially on account of the blow-fly pest, which is most difficult to contend with at lambing." Only reliable men should handle rams. They require very careful driving, giving them all the time that the slowest animal requires.

The usual percentage of rams to mate up is 2 to 2½, leaving them in for about eight weeks, taking out at the end of the first month any poor ones and replacing them with fresh. Economy in the use of rams does not pay, and there is probably no expenditure that will give better results than money spent on rams purchased from a first-class flock. In speaking of the percentage of rams to use, it should be understood that active, virile sheep only are included. Should they include any considerable number over four years old, a corresponding increase in the percentage is desirable.

After taking the rams out, a plan often followed is to again join them after a month's spell for another month. The idea is to catch the ewes that were not in season at the time of the original joining. The break of a month gives time to mark the first lot of lambs before the second drop comes. For instance, with rams joined during January and February, first lambing would occur during June and July; these could be marked middle of August. The second joining having been made in April, the resultant dropping would be in September. Good store condition in the ewes is best—though they should be thriving, not falling off—and, generally speaking, the rams should be fairly fat, as they usually fall away as the season progresses. It is advisable to restrict the joining to as limited a time as possible, because if dragged out over too long a period, there will be lambs of all ages, making it inconvenient for working, &c., and the late lambs, or those much younger than their mates, are not likely to do so well, being at a disadvantage in the flocks from their comparative youth and weakness. In order to prevent lambs coming out of season, it is necessary to have a very secure ram paddock, and a constant watch kept on it, to see that none get out among the ewes. It is also important that all rigs be kept from getting about, as they sometimes do through carelessness of one's own men or those of the neighbours. Rigs getting lambs do more harm than rams, as they are generally of less good breeding, and are likely to produce animals that will be rigs. It is better to destroy such at weaning time.

Many people yard the ewes and rams during the coupling season so many nights a week. This practice is commendable where there are small paddocks entailing no driving distance to yards, but on big runs it is a doubtful expedient, on account of the knocking about the sheep get constantly mustering them in 10,000-acre paddocks or larger, and the amount of dust lodged in the wool, together with a certain destruction of pasturage.

Do not breed from ewes under eighteen months, otherwise growth is retarded, and dwarfing must, of necessity, result. The practice of breeding from immature ewe lambs, even if well developed, can do no good to the flock. The size of the individual is checked, constitution is lessened, weight of fleece is greatly reduced, and the percentage of lambs raised from them is generally only 50 per cent. of that of the older ewes.

Put a few old ewes with the maidens when mating rams and during lambing. They give a lead to their younger sisters in becoming mothers and mothering. Keep the men riding round the paddocks to see that the rams are keeping with the ewes, and that they are fairly distributed. If this is not done, the rams get away by themselves, or a number of rams will follow one ewe, and fight and knock themselves about. If the feed supply in the breeding paddocks is not very good, rams should be removed from ewes for a rest now and then on good feed. Should the feed be scanty and of poor quality, it may be advisable to artificially feed them at the watering places.

A yard in every lambing paddock is an absolute necessity—not a luxury. On ordinary grazing country it is not necessary to go in for expensive arrangements. Timber of some sort or another is generally plentiful, and a good foundation of logs only needs retopping as the time for marking draws near each year. Such a brush yard, with lots of subdivisions, costs little, and if destroyed, can be easily and quickly replaced. It is poor economy to drive ewes and lambs one foot further than necessary. Do not lamb in large flocks; the smaller the better. Have the flocks of a size that will enable the number of men employed to muster, mark and have the ewes and lambs back to their paddocks within the same day.

It will be found sometimes that the rams are indolent, and will not work, although this is not often a feature of Merinos, unless they are over fat or old. It has been pointed out that rams should be in good condition, but sheep if too fat do not mate well, and it will often be found, after a good season, that the percentage of lambs is below what it is in, say, a medium or dry, though not droughty, season. If the rams are too fat, the first thing to do is to reduce the condition gradually, so as not to weaken them, and this is best done by cutting into their feeding time by yarding them carefully at night about three nights a week, giving them each week 1 oz. of Epsom salts per head in lukewarm water, and by drenching one hour before turning out in the morning. The nights they are yarded put into a trough a pannikin of bran or finely-crushed corn, and for each sheep to each pannikin add a tablespoonful of rape seed. Keep this treatment up for about four weeks before turning them adrift with the ewes. All rams before mating are the better for a clean out, and a dose of Epsom salts is the best for this purpose, where a feed of green rape is unprocurable.

The use of drugs to stimulate the sexual activity of rams is inadvisable. They must only be used with great caution, owing to their liability to produce irritation, and even poisonous effects, and their use also has a tendency to produce false desire followed by depression. It is far more satisfactory to stimulate natural desire by feeding a ration of oats, barley, or other grain. Impotence may be considered as Nature's method of checking the generation of undesirable strains, therefore the wisdom of forcing such generation by drugs is worthy of careful consideration by breeders in view of the possibility of begetting a strain without virility.

Reference may be made here to the practice of hand-serving, a practice which, although favoured by some men, we do not believe will give as good results as paddock service, that is among ordinary flock sheep. With studs it is a different matter, and should give an excellent return. One method is as follows :—The ewes are yarded daily, and flock rams, guarded with bagging to prevent service, are turned in. As the ewes in season are discovered, they are caught and placed in a separate yard, until all the ewes ready for service, or sufficient for the day for the stud ram or rams available, are secured. The ram and ewe to be mated are then placed together, and when effective service is assured the ewe is branded and turned into the served paddock. The served flock should be yarded two or three times weekly to find any ewes that have "missed," but as a general rule one service will suffice. During mild weather ewes will come in season about once every fortnight until put in lamb. Note must be taken of extra service, and those that do not conceive can be thrown out of the stud as they are probably barren. These apparently barren ewes, however, often conceive when the gross condition is taken off them by frequent yardings, or being run in a paddock where feed conditions are comparatively poor with rams constantly with them. To assure that the service of valuable rams is not wasted, stud rams should not be run with the ewes at any time, but kept in hand during the whole season, and hand fed. Exercise is, of course, essential, and a fair-sized yard or small paddock should be available. Fighting has to be guarded against at this season, so rams should not be run together; but if accommodation does not provide for separate pens, the rams should not have too much room, especially at night, and the known fighters should be provided with leather blinds, which are easily made. For feed during the season, the rams should have what hay they will eat, and 6 or 7 ozs. daily of mixed maize, oats and peas, with bran when needed. Fine-grown, short oaten hay should be provided in preference to any other kind, and a little green lucerne is useful, and much appreciated. If they show signs of scour, lucerne and bran should be cut out of the ration.

They should be fed regularly, and anything left over should be removed, as sheep do not like stale food of any kind, and do not thrive under the careless system which provides a lot of feed and makes them clean it all up. Weed out relentlessly all small, badly-grown ewes from the stud breeding mob, but hold them until they are three years old before finally discarding them. Where twins are dropped by a stud ewe it is advisable to put one of the lambs to a foster mother.

Keep all sheep held in yards or sheds supplied with plenty of salt. Something more than salt is, however, often required, and a mixture in the following proportions is recommended by an experienced sheep-man:—1 bag of salt, 15 lbs. sulphate of iron, 25 lbs. of slacked lime, and 15 lbs. of sulphur. The iron should be dissolved in 2 gallons of water, and the ingredients then mixed together. The sulphur may be left out in the winter if thought advisable.

Reverting to the question of hand service v. paddock service for flock sheep, the former requires a very expert and reliable shepherd, a man that is by no means easy to obtain. With small paddocks, and the sheep in proper condition for mating, paddock service will give just as good, if not better, results. The constant yarding of the ewes for hand service, and the general knocking about that is unavoidable, puts a " streak of lean" in them, and they become very nervous when calm is the desired end.

Care should be taken not to overwork valuable stud rams, otherwise serious injury and uselessness for further service may result. Dr. A. Norman McArthur, M.B., M.R.C.S., L.R.C.P., writing in " The Pastoral Review," a few years ago, said:—" I was asked to operate on a very high-priced ram. He had in 1914 produced 130 lambs, and in 1915 had failed to produce any. He had a swelling in the testicle, which I thought may have been a rupture. On examination, however, it was readily seen that the swelling was not a rupture. It was solid, occupying the greater part of the purse, and just below it was the shrunken atrophied stone. There was exactly the same condition on the other side, though not so far advanced, not so large, and not so much shrinkage of the stone.

" Dr. F. C. Lewis, D.V.Sc., B.Sc., Lecturer on Surgery at the Melbourne University Veterinary College, was with me, and we decided to operate and see what was the trouble. We found a huge tumour, which proved to be a solid clotting of varicosed veins which carry the blood from the stone up along the cord. The artery ran right through the mass, and the tube which carries the semen from the stone was also blocked in this mass. The stone, therefore, had long ago been rendered useless, so the mass with the testicle was removed.

" The other side was not touched, as we hope to get permission to try and enucleate the mass and leave the artery and semen tube and stone intact, to see if the ram would afterwards be able to produce lambs.

" We asked to see the other stud rams. The first of the ten or twelve we examined was a blood relation to the one we had operated on, and there was a little swelling about the size of a walnut above the left stone, which undoubtedly is the same condition just commencing, and if operated on at once we are certain this ram's utility can be preserved.

"Dr. Lewis and I therefore think it wise to give a word of warning to stud sheep breeders. In the first place, we recommend that high-priced stud rams should be examined every third month with intelligence and care. The stone should be thoroughly examined and the cord on each side should be carefully felt along its whole length, from stone to belly. Any little lump could then be discovered. It is hard to say if this condition is hereditary, but we are inclined to think that the peculiar formation of the vein which permits of the clotting is readily handed down from father to son. The vein is probably longer and very much more tortuous than is normal. Any injury, excessive use or very hot weather will help to produce the clotting just as it does in the leg of a man who suffers from varicose veins.

"We are disposed to think that sheep breeders often are liable to use a thousand-guinea ram excessively in his first season, and it would probably be a wiser policy in the long run to give him fewer ewes. We think also that the judges at sheep shows should pay as much attention to the conformity of the generative organs as to the quality of the wool and frame of the sheep. We feel certain that there is much more trouble of this nature amongst rams than sheep breeders will admit. Naturally a stud sheep breeder does not like it to be known that his high-priced ram is affected with such a malady. If this ram had been operated on more than a year ago, his utility could have been saved. The operation would have been nothing more than that for a varicocele in man."

Ewes, when carrying lambs, should have an abundance of good drinking water, and their eyes should be kept free from wool. They should never be disturbed or in any way frightened; the more gently and quietly they are tended at this particular time the better will be the result. No dogs should be allowed in the paddocks, and dry sheep should not be left with in-lamb ewes, as they are stronger as a rule and run about much more if disturbed, thus causing the droppers to travel faster and farther than they would otherwise. Three weeks or a month before lambing is due, the ewes, which must not be too fat, should be mustered, left in a yard overnight, and crutched. This, of course, is only necessary on country where flies are likely to be troublesome. On large dry leasehold areas it probably would not pay to crutch, but on "inside" country subject to flies it is an important factor in securing practical safety for the ewes when lambing. Whenever it is carried out great care is required to see that the ewes are properly treated and not dumped down on the board by the shearer, or pulled out of the pen by their legs. The left arm of the operator should be placed well down the animal's neck and around the brisket. The off hind leg should be seized with the right hand, and drawn forward. The sheep should be gently lifted, and deposited on its rump, backed up with the operator's legs, and have its head doubled to the left. The eyes should be well cleaned, and then a beginning made at the lower edge of the belly, cutting away the grease tags to allow the lamb to locate the teats. The cut should follow down to the tail, leaving a clean track, so that the afterbirth and urine do not collect and encourage the attention of flies. Care should be taken not to cut off the tip of the vagina.

Spraying all lambing ewes or other sheep likely to be struck by the fly is strongly recommended by some breeders instead of crutching. The sheep can be treated in a branding race, running them slowly through and spraying every ewe in the crutch and over the parts likely to be affected with a strong solution of arsenical dip. No handling is required, and several thousands can be treated in a day. The system is cheaper than crutching, and saves damage to the wool. A powerful spray is used—jet is a better word—and the mixture is driven right to the skin by a power pump. A fuller description of the process appears in the chapter on dipping.

The ewes are next separated into their various paddocks, and it is very necessary, as far as is possible, that the paddocks thus allotted will carry the respective flocks until after the ewes have finished lambing. The reason is that the ewes pick out their own particular locality to drop their lambs, and become acquainted with the watering places, shade, &c., and have settled down and become contented by the time the lambs arrive.

LAMBING.

The best time to lamb is a most important consideration, and one sometimes lost sight of. The season at joining time has to be considered, but the main point is to lamb when there is likely to be green feed for the ewes. Lambing on dry feed means a poor return of under-sized lambs. Unless there is green grass the ewe's milk is poor in quality and quantity, and such milk has always, more or less, an astringent quality which will cause impaction amongst the lambs, and unless lambs suffering from this trouble can be individually treated, death is almost sure to result. Epsom salts in the troughs for the ewes, or a drench of it for individual lambs, is useful treatment. When the natural grass is dry the ewes should be fed when possible with artificial growth, which will tend to increase the flow of milk, and bran should be included in the ration. As a general rule, of course, special food of the kind suggested can only be provided for stud ewes, or when a drought means the loss of both ewes and lambs where feeding is neglected. Extra care and attention should be given to the maiden ewes, especially when going on to new country, and it is a good plan to run some aged ewes with the young sheep to steady them and lead them to water. If neglected, the young ewes may hang on the fences, or cut into small lots away from rams, and a poor drop will result.

If the lambing ewes are found to be fly-blown, go round with your most careful sheep-men and a supply of disinfectant and wire netting to make temporary yards at any place where affected ewes are found. Provided they are handled carefully, little or no loss will result. Leave the dogs at home that day.

On or about the 146th day after joining, early lambs may be expected. If the ewes are very fat a really good return may not be looked for, as they do not breed well under such conditions. If ewes owing to season are extra fat their condition should be run off them by crowding them together on short feed before the joining season. Further advice on this point will be found in a previous chapter on lamb-raising for export.

During lambing men should be amongst the ewes daily, Sundays included, to give help where necessary, and to lift ewes that have become cast. This precaution is especially necessary in hilly country. Sunday work is absolutely essential at this time, otherwise lambs are bound to be lost at every week-end. With stock values as they are now it pays well to give the men extra for this work, or pay a bonus to the sheep-men who show the best results in the flocks under their care.

Watch the water supply carefully. If the troughs are not kept quite clean the water quickly fouls, and the ewes will not drink until absolutely forced, and this damages the lambs through the reduced milk supply. Troughs should be cleaned out at least once a week during the summer months. Sheep, especially ewes with lambs, should not be allowed to water at open tanks. This is a wasteful system, and the water in summer is never as clean as it should be.

With regard to the actual operation of lambing, the ewes should be seen every day, and the men on the job should keep a careful eye lifting for any ewe in trouble. If all has gone well in giving birth, the mother will be found in a standing position with her lamb sleeping, either underneath her, or close to one side, but if she is seen getting up and lying down alternately, things are not going right, and she must be watched very closely. The attendant should not on any account interfere with the ewe until he is quite certain that the animal cannot expel the lamb herself. When the ewe finds that she is unable to do her duties without assistance she will more readily submit to the help of the attendant. The first thing is to ascertain whether the presentation is natural. The natural presentation is the muzzle foremost, and a foot on each side of it. Should all be right in this respect, he must proceed to disengage the lamb. Sometimes the head is sufficiently advanced, but the legs are too backward. In cases of this sort the head should be gently pushed back and the legs placed in their natural position equal with the head. Should the forelegs, on the other hand, protrude, they must in like manner be returned, and the same assistance given to the head. If the hindquarters present themselves first, the hand must be applied to get hold of both the legs firmly, and gently draw them. The lamb may often be easily removed in this position.

It is an uncommon occurrence to find the head of the lamb protruding and swollen; but still, by patience and gentle manipulation, it may often be gradually brought forward. Sometimes, though, the head and neck is too much swollen, and in cases of this sort the head must be taken away, and the lamb can be forced back, thus leaving room to secure one of the legs, and effect the delivery. Sometimes the legs are thrust out to the shoulder, preventing one from replacing them so as to get up the head of the lamb. In cases like this, the only possible means is to skin the legs, and disunite them from the shoulder joint; there will then be room to operate, and deliver the unfortunate animal from the excessive pain which she is suffering. It is a very bad plan to exercise too much force in performing an operation; however, sometimes it is absolutely necessary, but when used it should be as gentle and consistent as possible. The increased value of sheep renders it more important than ever to bestow great attention at the period of lambing, so as to save as many lives as possible. The attendant should be perpetually on the watch, and the eye of the master should superintend the whole.

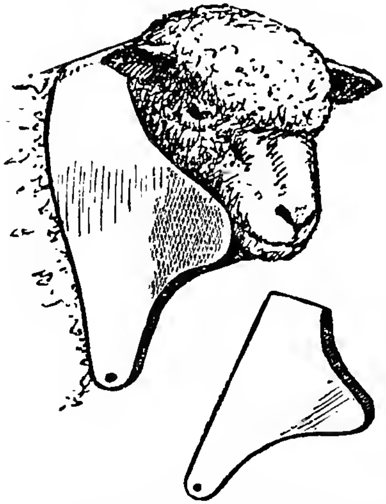
It may be found that there is a certain amount of trouble with ewes slipping their lambs. It is difficult to ascribe it to any specific cause, although undoubtedly the most prolific source is carelessness. Men will overdrive ewes in lamb, and push them through gateways with yelping dogs hurrying on the laggards, *i.e.*, those heavy in lamb. Of course dogs are a necessity on stations, but they are often over-used, and, generally speaking, the work of the employees in handling sheep requires much closer scrutiny than it frequently gets. Too much soft green feed will sometimes cause abortion, and crutching, too, is often responsible for losses from this trouble. The ewes are overdriven to the yards and rushed through a great many gates before they are returned to their paddocks for lambing. While at the shed they are sometines thrown down the shoots into the pens after being crutched, and this drop of several feet will certainly be responsible for the loss of lambs from ewes that have reached the critical or turning stage.

In a good season, when the grass is long, it is generally found necessary to ride the lambing paddocks very much closer than in a year when the ground is bare. Condition and an abundance of wool are always inclined to get a certain percentage of lambing ewes cast, and it is very much harder to find a cast ewe amongst grass than if she is lying on a bare place. Of course more ewes will go down in a drought than at any other time, but it will be found that not so great a number are found in this state in an average year as in an exceptionally good lambing. In a drought there are more eagles and crows about, and so the ewes are in more danger when down than they would be in an ordinary season. Indeed, at such times few sheep die from the actual effects of being down, but they are cut to pieces and slowly tortured to death long before they would otherwise die. However, there are always some crows and eagles about, and in any year, if lambing ewes be neglected, a certain number of those that are cast will be torn. Sometimes a ewe will be only slightly torn when found, but having been put on her legs will be attacked and blown by flies, and so will in the end lose her life. If, however, she is let alone by flies, it is remarkable from what cuts and tears she will sometimes recover.

A few days after they have finished lambing, and when the lambs are strong enough to follow their mothers, the sheep are better if removed on to fresh pasture, but this must be done most carefully, without a dog, by making an opening in the fence about three panels wide, and allowing the sheep to draw through on their own account. Even if it takes the best part of a day it is time well spent. If an owner has ploughing to do he will act wisely if he times his ewes to lamb when the cultivation is over, so that the bulk of his time can be devoted to tending the sheep.

Considerable trouble is likely to be experienced at lambing time from sundry pestilential enemies, such as hawks, crows, foxes, dingoes and flies. The last-named will be dealt with in a special chapter, as it is too big a subject to be treated in a brief space. Possibly the worst enemy of all, and the most difficult to poison, is the crow. He is a gross feeder on most occasions, but he becomes an epicure at lambing time, especially when he finds a flock unprotected by poison or other precautions. He is absolutely at his worst, however, in a bad season, when the Merino ewe, short of milk and otherwise disheartened, is inclined to neglect, if not entirely abandon, her offspring. The crow will then follow the flock all day, and gorge to repletion on eyes alone. Baits should be laid freely near all the tracks, except travelling stock routes, using some "useless" old horse, about 10 days before lambing starts. Phosphorus is the best poison (see Chap. xxvi.). Another way to scare away crows is to give the shepherd an old gun for the first couple of days. He is fairly certain to shoot a few, which he can hang up conspicuously. As well as this, let him get a few green sheepskins and spread them flesh side up on an exposed tree stump. Get some phosphorus or strychnine, dissolve it in boiling fat, and paint these skins. This will poison a lot of crows, and they can be hung up. By keeping on in this way, it is remarkable how the crows leave. The skins will also poison millions of blowflies. Further, it is a good thing to carry a lump of bluestone when going the rounds of the paddocks, and thoroughly rub the eyes of sheep that have been pecked. This will help to obviate blood poisoning, which is likely to arise from the crows' beaks having become infected in putrid carcases. Do not use the powdered bluestone, but the lump.

Foxes are fairly easily poisoned, as also are eaglehawks (see Chap. xxvi. re the latter). The trouble with the former is that they work at night, but by poisoning all dead lambs and dragging the entrails round the tanks, many will be captured. One or two quiet but good greyhounds will also do useful work. The accompanying sketch shows an effective guard for lambs against foxes.



Guard for Lambs against Foxes.

devised by Mr. H. W. Ham, of Lara, Victoria. A close examination of a dead lamb, showing no outward marks or signs of blood, will reveal how the fox has done his work, showing fang marks over the jugular vein when the wool over it is opened. The most cunning foxes toss over the lamb, and grip it across the throat, close to the jaws underneath, and close up to the back of the ears, sucking blood through the teeth. The guard illustrated covers as nearly as possible the parts mentioned, and yet allows the lamb to raise its head to suck, or bend it to nibble grass. It can be cut from kerosene tins, about 2 in. wide at the top of the neck, and 3 in. or more below, fastening at the neck with a piece of fine wire. This will give some idea of dimensions. The flanges are slightly curved outwards, as shown in illustration. The guards should be removed at from eight to ten weeks.

The dingo pest will also be fully dealt with in another chapter. The poisoning of a run should come under the supervision of some responsible person, otherwise it is neglected or done in a perfunctory manner, especially by station hands, who fear that their sheep dogs may become victims.

CHAPTER XIV.

MANAGEMENT OF A MERINO FLOCK (*continued*).

LAMB-MARKING AND SHEARING.

General Notes on Lamb-marking—Plan of Yards—Cleanliness in Tools—System of Age Ear-marking—Castrating—How to Hold the Lambs—Dressings—Tailing—Knife or Searing Iron—Mothering the Lambs—Marking Stud Lambs—Cleaning up—Branding —Weaning—Shearing—Watering Yards—Cleaning the Shed—Blood Poisoning—Shearing Lambs—Stud Rams—Device to Assist Drafting into Shed—Shearers' and Shed Hands' Duties—The Skirting Tables.

The next important operation in connection with the young lambs is marking, and it is one that requires care and close attention to cleanliness. Use clean temporary yards, erected especially for the purpose on fresh grass land, to be taken away again when the work is completed, and put up next year in some other spot. Some owners still use old dirty enclosures, but happily they are in a minority. The first reason for the temporary yard is its freedom from the germs of blood-poisoning. Most lambs lie down after tailing. The cut purse of the wether then comes into contact with the ground. The old drafting yard probably has had sheep passing through it for fifteen or twenty years, and each winter lambs have been marked there. The soil is saturated with blood, urine and dung. It is almost certain to contain bacteria, and some of these are of a septic character. Wether lambs infected from such a source may not, of course, die. Very many of them may suffer from local trouble, from which they will recover; but there have, nevertheless, been many cases of a proportion of the lambs marked in a certain yard dying during the three weeks succeeding the operation. The deaths in such instances are practically certain to result from poison picked up from the filth-laden ground.

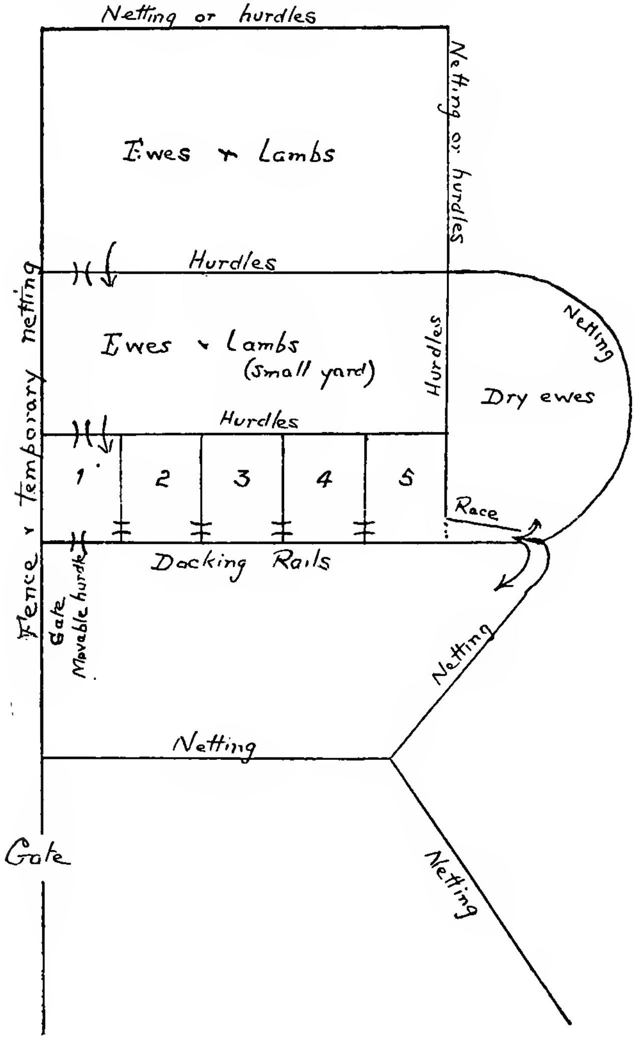
Another important advantage arising from the temporary yard is that the lambs, after being caught in it, are dropped into their own paddock. Then when all the lambs from a pen have been tailed, and let loose into the open, the ewes from that pen are allowed to follow them. The gradually increasing flock extends away for a quarter or half a mile, and all the while lambs are finding their mothers. By evening very few lambs will be left "unmothered," and there is no chance of any of them remaining all night without food, as is the case when the whole flock is tumbled pell mell into a paddock in the dusk of evening, with the business of mothering only then to commence. If it is imperative that old yards should be used, they should at least be thoroughly cleaned and sprayed before using.

The yards should, if possible, be erected near to timber or warm gullies, so that the lambs, as they mother, or before, will not be exposed to the full blast of the winter wind. Lastly, a great advantage of tailing in the paddock where the sheep are kept is that once the lambs lie down after they have been operated on they are not again disturbed. When they are driven home, bleeding is recommenced in a number of cases, the scabs are rubbed off as the flocks squeeze together at the gates, and the physical exertion of walking not only exercises a directly harmful influence on the weakened system, but it increases the flow of blood by stimulating the circulation.

Lambs can be safely marked—that is, castrated, tailed and earmarked—at any time after they are a few days old, but owing to the time the rams and ewes run together, it is impossible to mark them all at the same age, so an average age of between four and five weeks is the best to look for. In small or stud flocks the breeder can use his discretion, and mark his lambs at the age he considers most suitable. The most important points to be observed are to avoid undue haste, rushing the sheep to the yards, and marking whilst hot, or during the hotter parts of the day.

The plan on the next page, which is from "The Pastoral Review," and is recommended by expert sheep managers, provides a serviceable cheap yard which is movable, if erected with hurdles, stakes and wire netting. Any dimensions can be followed, and the advantages of such a yard are:—The pens 1 to 5 being filled, the marking starts in pen 5. Whilst this pen is being done, the overseer can go through the ewes in it and raddle the dry ones, and when the lambs are marked the pen is drafted, and dry ewes run off. Whilst the ewes are being drafted the marking proceeds in pen 4, and when finished this pen is run into 5 and drafted, and so on with the remainder, the overseer and one man doing this work. There is then no loss of time. Some people will point out that it is quicker and better to draft off the lambs before marking. There is this objection. Unless care is taken the lambs are apt to smother and knock themselves about; also if the ewes have to be run through a second time to get off the dry ones it entails a lot of lost time, and if it is done whilst marking, more men are required. Again, to have a three-way race so as to draft lambs, dry and wet ewes at once, means more erection, also all the loss of time wasted, and having a lot of men idle while the dry ewes are picked out before drafting the lambs. With the accompanying plan 4000 lambs can be marked in a day.

It is a distinct advantage to pick out the dry ewes. It relieves the paddocks, it prevents a string of ewes trying to break away when mothering outside the yard, and consequently drawing numberless lambs after them. By this means, and if a good season,



Plan of Lamb-marking Yards.

these ewes can be remated, when a certain percentage will get in lamb, the dry ones being again culled, until eventually all the barren ewes are disposed of to the fat sales.

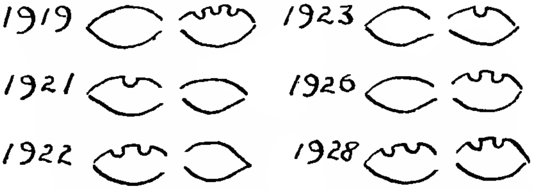
The safest time to choose for lamb-marking is cool, dry weather, and the lambs should not be heated when marked, so, where they have to be mustered out of paddocks, they should be yarded overnight or at daylight in the morning, and lambs should rest a while after being yarded before marking commences. Marking in cold weather is very trying on lambs, and, following on marking when they are sore and stiff, severe forms of rheumatism are likely to attack the newly-marked lambs. Numbers often die from this cause, apart altogether from the setback they get on being marked.

In constructing the yards sharp corners should be avoided if possible, and another important item is to see that all knobs on the timber on the inside are smoothed off level with the rail, or sheep are apt to get staked, especially lambs. The catching pen and marking rails should be thoroughly clean, and, as already advised, if used at any previous time thoroughly disinfected. To this end, the rails in these panels should be adzed smooth, so as to prevent the congregation of deleterious matter, which is conducive to blood poisoning.

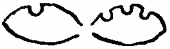
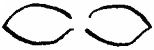
As stated, there are really three operations—ear-marking, castrating the male lambs, and tailing. The rail on which the lamb's rump rests should be just high enough to reach to about the lower part of the chest of the operator. This gives the required leverage when extracting the testicles with the teeth. The rail should be covered with a woolly skin, laid with the flesh side up. Only skins off butchered sheep that have been properly bled should be used, and they should be dried under cover by laying along a pole, head and tail, with the trotters left on. The weight of these prevents the skin from curling up at the edges, and forming a harbour for microbes. Before using, the skin should be disinfected and laid in the sun for an hour or two the day before using. This disinfecting should be repeated after each flock is put through. The ear-mark should be put on the lamb first, then passing on to the tail docker. If a male lamb, castration follows ear-marking, and the tail manipulation last. This saves both catcher and operator from being spattered with blood. The ear markers—one to do the age marking and a second to put on the registered mark—should stand inside the fence, opposite each other, and need never move, the catchers bringing the lambs to them before coming to the fence to the cutter. The latter, with a tar boy, should have all hands in front of him, and a clear field for himself to move in without any chance of being hampered. Always have thoroughly careful and responsible men to do the ear-marking, and personally see it is done properly. It is very aggravating and a fruitful source of trouble at the race gate when sheep have been carelessly ear-marked.

Cleanliness in tools used is most important. Ear-markers and knives should be disinfected daily before starting work. When marking is completed the instruments should be thoroughly cleansed and oiled before being put away. Blood poisoning accounts for a number of lambs in some seasons, so it pays to keep all instruments thoroughly clean. They will last years longer if never allowed to rust. There are, of course, numerous systems of age ear-marking, but the following on stations where all sheep are race-drafted can be recommended as answering all purposes :—Year one, full ear ; year two, front notch ; year three, two front notches ; year four, tip notch ; year five, tip and front notch ; year six, tip and two front notches. Do not mark on the back of the ear, it is not easy to see in a race, also by the time six years are reached there is no possibility of confusing two corresponding marks in sheep with six years between their ages. Put all the marks, including the registered mark, as near the tip of ear as possible. The back of the ear should be used for only one mark, and that is the cull mark. It is, however, not altogether an easy matter to lay down any fixed system for age-marking without knowing the owner's registered mark. It is most likely that one of the age-marks will conflict with the registered mark, for no matter how different marks look on paper, there is very little difference to be noticed on a sheep's ear when running through a drafting race.

During the process of lamb-marking, the owner's registered ear-mark is usually put in the near ear of the wether lambs, and the off ear of the ewe lambs. One system of age-marking general lambs has been given, and another as follows, based upon a series of tens, or decades, is a simple method. The age mark representing a number, is composed of notches of a value of one or three, according to their position on the ear. It is immaterial whether the flockmaster selects front, or under, or left, or right ear for the order of the numerical value of the notch, so long as he adheres to his system, once he has formulated that most convenient to himself, having regard to his registered owner's mark, visibility in yarding and racing sheep, &c. In every case of the age-mark, in series of tens or decades, the sum of the notches signifies the terminal or unit of the year in which the animal is born. The terminal or unit of, say, the year 1919 is 9. Lambs born in 1919 would be marked with a 9. If the value of the notch, for example, is taken as one on the front or top of the left or near ear, and of three on the front or top of the right or off ear, the following are illustrations of the corresponding age-marks :—



The year that ends in 0 can be represented either by ten, as

 or by nothing 

In practice it is found preferable to represent it by ten, as by omitting the age-mark altogether for the years ending in 0, there subsequently arises doubt when working the stock whether the sheep devoid of an age-mark had been lambed in the year, say 1920, or had escaped age-marking. It is perhaps not very material, but everything that saves time and unnecessary handling of a sheep is important.

Under the above system of age-marking in series of tens or decades it is, of course, the case that a lamb is marked with the same age-mark as that used ten years previously, but this period of time in the life of a sheep is so great that no confusion is likely to arise from the circumstances. It is not probable that even a tyro in stock management is likely to take a two-shear ewe for a twelve-year-old crock, even if the latter survives the vicissitudes of life to so venerable an age. Moreover, all the first lot will probably by then have either been marketed or cast for age.

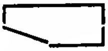
The age-mark can be all on one ear, giving the top notch the value of one and the under notch the value of three. Or the tops of both ears can be used, as in the preceding illustration, or the under edges of both ears. As already stated, this is immaterial so long as a system once adopted by the flockmaster is adhered to constantly. For stud sheep the numbered metal tag is the best, as it records the age and pedigree as well.

Regarding the method of castration, opinions are divided. Some men slit the purse, others cut a piece off right across the end, and in these days of the blowfly, the latter system seems to give rather the better results. It is suggested that matter collects in the purse which has not been slit clean through, and this attracts the fly, while on the other hand the purse with end cut off allows all matter to escape. However, there are many advocates of the other method, and after a little experience the owner will probably be satisfied in his own mind as to which suits him best.

Before commencing actual operations, it is a good idea to turn out a yard of grown sheep for the purpose of steadying the lambs until the first yard is cut, and the ewes counted out. The lamb should be held on the rail by grasping the legs, which are placed parallel to each other, that is, the fore and hind legs of the same side, the back of the lamb resting against the catcher's chest. Do not allow the legs to be pulled too far apart, as this very often injures the limbs.

Whichever method of opening the scrotum is adopted, care should be taken not to cut too deep, but just enough to allow the testicles to be grasped with the teeth. They should be drawn as cleanly as possible, without any biting or breaking, and both should be drawn together, then giving the purse a pull down and a squeeze in the case of cutting off the end. With slitting, close up the purse with the thumb and first finger of each hand. It is very advisable to swab the quarters and all the cuts with a fairly strong solution of disinfectant. Some lambs bleed very freely, and if the blowfly is troublesome disinfectant will probably save a good many lambs. A good mixture is castor oil and Stockholm tar, with sufficient kerosene to make a thin mixture. The following proportions will be found successful :—3 pints of castor oil, 5 pints of kerosene, 2 pints of Stockholm tar, ½ pint of turps. Much the same constituents are recommended by a practical station manager, who says :—" I use a preparation of two gallons of tar, two gallons of kerosene, and one gallon of castor oil, boiled together, and well stirred. It is good in dressing sheep that are blown. After the wool has been cleared away and the maggots removed, it is put on thinly, and is very efficacious in keeping the fly away until the wound is healed. I do not recommend it as a cure, although I once put some on a ewe which I saw blown out in a paddock, and next morning all the maggots were dead. It is a good preventive." It may also be mentioned that a strong solution of bluestone (sulphate of copper) mixed in an earthenware vessel, and applied with a rag swab, is a great preventive of tetanus ; it also saves excessive bleeding, and keeps away flies. Care should be taken to prevent the entry of the solution into the purse by holding the latter between the thumb and finger.

The last process, tailing, requires care to give a uniform dock, which sets off a mob of fat lambs as well as stores. Here again, with regard to the method, there is divided opinion between the knife and searing iron. Most men favour the former, and consider it is quicker and just as effective. The searing iron is slow, thus more expensive, and it is not always possible to keep the irons at just the right temperature or to get the right man to operate them. The result is often bad tails and tetanus. With the knife it is only necessary to dip it in a solution of lysol or other steriliser, and it is ready for use. Keep from four to six knives handy in an open case, marked A, B, C, or 1, 2, 3, and so on, so that when A becomes too blunt it can be dipped in the steriliser and sharpened up. The tail should be cut at the joint if possible, the second joint from the butt leaving a nice length. By slipping up the loose skin with the thumb, when the tail is severed the skin springs back and helps to cover the wound, which, if the knife is in proper order, is a fairly clean cut, and in many cases "heals with the first intention," to use a surgical term, and there is little loss of blood. In cases of bad bleeding dress with a mixture made up in the following proportions :—50 lbs. fat, 1 tin kerosene, 1 qt. spirits of tar. The fat must be thoroughly melted before adding the kerosene or spirits of tar.

For those who prefer to use the searing iron, the following may be found to work well, and is recommended by a Queenslander. The "operating table" consists of a 6 x 1 board, to which pieces of 3 x 1 about 1 ft. in length cut thus—  are nailed within 1½ in. of the edge.

The heads of two hurdles where they meet flush are sawn off, and one edge of the board is rested on top of the hurdles, the other on stakes driven into the ground, to which they are lightly nailed, as the outfit has to be moved to other paddocks.

The tail is slipped under the slot of the short piece, which gives the necessary protection from burning anything but the tail, and the flat board receives solidly the pressure of the iron, and gives a good rest for the lamb.

The slot should be tapered back, as it will then accommodate any sized tail, and the length of tail fancied can be regulated to a nicety by the thickness of short pieces used. The chisel-shaped iron is far the best, and the table might be better an inch wider, with the short pieces also wider, and thickness according to length of tail desired. They should also be spaced to set a lamb between them.

When releasing the lamb after marking, the catcher should first put it in a horizontal position leaning over the rail, and then release the two hands simultaneously. This drops the lamb on all four feet. The wrong way is to drop it on the rump, or carelessly release it, which often means a broken leg. The mothering of the lambs is probably the most important of all the phases of lamb-marking. Ideal conditions for marking would include a large temporary netting yard for letting go into, where the ewes would have plenty of room to find their lambs. Where possible, as already stated, it is advantageous to mark straight into the paddock, as the ewe, if let go, will have a feed and come back and look for her lamb. Moreover, it obviates the task of shepherding sheep out of the yards, a job for which it is very hard to get really competent men ; it requires the utmost care and patience. With a temporary yard, however, as has just been described, when ready to be let go a portion of the netting can be rolled up and a wide opening made through which the ewes and lambs can draw quietly away from the yard. It is most necessary that both should be kept in hand until all the lambs have been mothered. Frequently in yard work the gates are thrown open and both ewes and lambs let go without any attempt at mothering. This means, of course, a number of motherless lambs that will die, or at the best will only grow into poor, undersized sheep. To avoid this, which is often the result of hurrying to get things finished before dark, the work should be done and the sheep out of the yard by three or four o'clock, to enable them to be kept in hand for a couple of hours, until all the lambs have found their mothers.

In marking high-class studs where it is necessary to obtain the mother of each lamb for pedigree purposes, run the lambs off and give an hour or two away from their mothers. Then put the ewes and lambs in adjoining yards, and drop one lamb at a time into the ewes, and watch until he finds his mother. The lamb is then marked and ear-tagged and recorded in the stud book. There is a good deal of knack in the work, which can only be acquired by practice. The great thing is to keep quiet, have only a small mob on hand at one time, say thirty, and to watch for a lamb calling and the mother answering. The sire that was with each flock is, of course, already recorded.

After the marking is over the tails can be counted and the percentage arrived at. All tails, dead lambs, etc., should be burned, and all utensils and implements cleansed and greased before being put away. The rails of the yards and floor of catching pen, if permanent, should be washed over with lime, or if hurdles are used, as in outback runs where yards are carted from paddock to paddock, they should be lime-washed before being stacked away. These few little cares are very necessary. They well repay the trouble, and farmers and pastoralists will have fewer outbreaks of tetanus and blood poisoning to report. A loss of 1 per cent. of lambs between marking and shearing on big country is usual, but any greater loss in a fair season probably indicates some neglect.

Where the losses occur is in rushing the lambs to the yard and marking them whilst hot, and allowing them to run away from the yards after marking without sufficient mothering.

Branding sheep is a matter regarding which little need be said. There is not much in the actual operation, and with a little common sense and practice it can easily be carried out neatly and efficiently in fulfilment of the laws to which the owner is subject. The regulations vary in the different States of Australia and other countries, and the sheep-man will be well advised to secure a copy of the Brands Act under which he is liable.

It is particularly desirable to have brands legible, and will save much trouble in regard to sheep and skin stealing. With the ordinary run of crossbreds and loose-tipped long-woolled sheep, there is considerable difficulty in maintaining this legibility for any length of time, and to be of any real value the brand should be put on twice a year. This should be sufficient if done with a good blue paint, which shows out better on white-tipped crossbreds than the ordinary black marking stuffs. The branding paint requires to be differently mixed than that used for treating Merinos, and should be thicker and dry more quickly. Another point in the branding of crossbreds is that there are special portions of the skin to brand on, where the wool is inclined to be more blocky in the tip. These are on the rump, the middle ribs nearer the back than the belly, and about the middle of the shoulder, the paint being put on by pressing the brand on the skin, not hard, but firm, instead of dabbing as in the case of the Merino.

Sheep owners should never use any branding preparation unless they know that it can be removed from the wool in scouring. The presence of tar or pitch is an abomination, but even that is not so bad as a paint the colouring matter of which is a fast dye.

Wool is often seen after scouring, from which the grease, &c., has been removed in the ordinary way, but the brand has been driven right into the centre of the fibre, and nothing would ever get rid of it. Naturally the manufacturers regard this as very serious. Pitch, as already stated, is a nuisance, and causes trouble and waste, but it does not penetrate the wool as deeply as in the case of the paint above mentioned. Avoid it, however, and if a liquid branding preparation is used make sure that it contains no ingredient that will not come out in the scour.

Returning to the lambs, if the season is good, experienced men allow as long a time as possible after marking before taking them from their mothers. The average age to wean is about three months, but it varies according to circumstances. Always have the necessary paddocks to receive the weaners, spelling for some time previously;

they want the paddocks with the softest and greatest variety of feed, with plenty of shade and water; running water very much preferred. It is most essential to see that these young sheep keep developing; once they get set-backs as lambs they never properly recover. Grass seed is one of their worst enemies, and if it is impossible to avoid it, and the lambs cannot be shorn at the time, at least get them into some handy yard, and go through them carefully, taking the grass seed out of their eyes and wigging any very woolly ones and crutching any that are daggy.

The sexing of the weaners can be carried out, say, as they come up for shearing as hoggets. The ewes after shearing then really become the maiden ewes, and are kept separate until classing time, after which they go to the rams, being then eighteen months to two years old. The wethers are either sold or kept for one or more years before being turned off. At sexing time it is good policy, if only to indicate thoroughness, to run off all black weaners of either sex and put them in the killing paddock for rations; also any deformed or otherwise useless sheep. They can be boiled down and skinned, and some profit made from them; otherwise if left in the flock they eventually die a dead loss. The foregoing remarks apply more particularly to Merinos.

Crossbred and English breeds of lambs require different treatment. When weaning these it is necessary to have netting fences or some very secure break. If these lambs are to be held any time they are better shorn. This class of sheep requires smaller pastures, and plenty of succulent fattening feed and water, with shade. Being principally bred for carcase and soft handling flesh, the production of same as quickly as possible is the object aimed at.

SHEARING.

Coming next to the question of shearing, little can be said here that will be of use to the young sheep-man. Space has been devoted elsewhere to designs and specifications of shearing sheds, and the rest of the business is mainly a matter of obtaining competent and reasonable men to take the wool off. Tact, a knowledge of men and how to handle them, are the chief qualifications required at the "ticklish" time of shearing. Every owner should carefully study the terms of the Shearing and Shed Hands Awards to which he is subject, and it will be found that it will well repay him to become a member of the Farmers' or Graziers' or Pastoralists' Association in his State. When a moot or difficult point arises in the interpretation of an award he can always get legal advice regarding it from his own Association, and putting on one side the individual aspect of the case, it is a duty he owes to the great industry in which he is engaged, to accord his support to an institution whose aim and object is to protect and further the best interests of the primary producer.

Reverting to the subject of shearing, little can be written, as we have already stated, beyond what has previously appeared. In most of the Australian States the work is done at a particular season, generally commencing in August; in Queensland shearing operations extend over the whole year, although the fly trouble, which is worst there during the spring, is forcing some owners to alter their dates.

It is a great advantage to the wool to have the yards watered if possible, and every shed should be thoroughly sprayed with carbolic before shearing. The wool shed is in many instances used in the off season as a receptacle for many germ-carrying products, such as dead wool, bones, old sheep skins, and the trotters cut off sheep skins prior to sending to market. Pens are used to spread the dead wool out on, and the counting out pens are often used to dry dead wool. These are all more or less sources of infection. The shed is usually locked up and dark the whole year round, and is the home of dust, cobwebs in dense masses covering up the only means of light getting into the shed; in fact, instead of being the cleanest outbuilding on the place, it is often the dirtiest. The board and pens especially, a week or two before shearing starts, should receive a thorough cleansing and disinfecting, but before the washing down is done all the dust possible should be swept up and burnt, cobwebs swept away, and anywhere dust can accumulate overhead. Mysterious deaths often occur among sheep after shearing, but the real reason of it is blood poisoning, resulting from the microbe-laden dust from dead wool, etc., being brought down by the vibration of the machines, and falling into the cuts of the newly shorn sheep. This blood poisoning usually occurs among the first shorn, therefore, as an extra safeguard, it is advisable to put through trial sheep first, such as ration sheep. The outside yards, more especially the counting-out pens, should be made as clean as possible, because it is into these pens the sheep first go. The surface of them should be removed and burned, and then lime and carbolic sprinkled over the new surface. The rails of the fences should be washed with the disinfectant, and every crevice saturated, especially the mortice holes, as most danger lurks there, being protected from light and winds. Of course it is quite possible poisoning may arise by infection of the cuts away from the shed, such as by blowflies, etc., but provided thoroughly hygienic measures are adopted as outlined above, and machines, combs and cutters, brushes, etc., are sterilised in boiling water before starting, there should be very little mortality as a general rule.

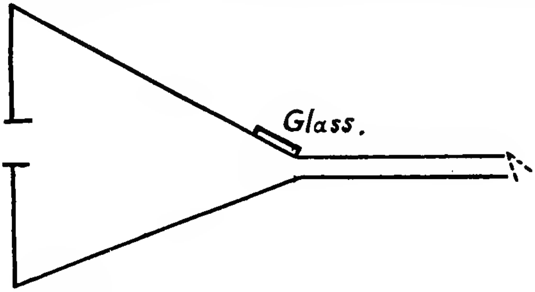
There is diversity of opinion in regard to shearing lambs, some considering that those left unshorn gain more weight, while others take the opposite view, viz., that they will not grow with the wool on, or do so well as when shorn. Generally, however, under Australian conditions, it will probably pay better to shear the lambs as soon after weaning as possible, as the woolly lamb is liable to get full of seed or burr, and is more prone to the fly. If the lambs are weaned at the shed when the ewes come up for shearing, the one drafting and mustering does; each lot of ewes and lambs can be shorn as they are mustered, drafting before entering the shed and shearing a run of ewes and a run of lambs, and lambs can go away to the weaning paddocks. When they are shorn again at the following general shearing, they have a fleece of pure hogget wool, with a level tip, dense and brighter then if they had been left unshorn, when the fleece would have a wasty, spiral tip, open and discoloured. Thus by the lamb shearing, two clippings of wool are got the first year, both of which are true to label, lambs and hoggets.

With regard to stud rams, they should never be shorn at the general shearing, and if it is not practicable to deal with them beforehand, they should be put on the board first. The men have not yet got their hands in for fast work, and in case of trouble later on, it is always best to have the rams already through the shed. Only very careful, good shearers should be employed, and they should be paid wages rather than be engaged to shear by contract. After being shorn, if the work is done in the shed, the rams should be returned to the catching pens and walked out of the shed. On no account should they ever be allowed to go down the chutes, for fear of broken legs and ricked shoulders.

Rams should be seen every day for a time after being shorn. They often fail to recognise each other with the wool off, and desperate fights take place with much resulting damage that calls for prompt treatment. Valuable stud rams should be kept in small paddocks where they can be seen frequently. Known fighters should be hooded to discourage them.

When mustering the sheep to the shed, endeavour to bring them in the same order as shorn the previous year, so as to have the full year's fleeces; also follow one flock with another as nearly the one kind of sheep, so that if any of the wool has to be mixed it will blend.

Often it will be found that there is considerable difficulty and disturbance in drafting sheep into the shed; an old mirror will be found of great assistance. Just place any old reflecting glass, say 3 ft. by 3 ft., opposite any door, even some distance in. It is a good plan to nail a couple of 3 x 1 battens across the studs and drop the glass between, so that it can be changed from place to place when necessary. The glass is also an aid in taking sheep through the drafting race, and for this purpose it should be fixed just outside the fence at the mouth of the race, as shown in the sketch.



Using a Mirror to Assist in Drafting Sheep.

A word of advice regarding the duties of the shearers and shed hands may be given. The shearer should be compelled either to carry his sheep out, or if in heavy sheep to sit it up in the pen and walk backwards with it, dragging it on its rump by the forefeet, with its back resting on his legs. Picking up should be done by a boy or man to, say, five shearers, and he should not be allowed to carry more than two fleeces at a time. The boss of the board should see that he picks up the fleece by the two sides of the neck and then doubles it back on the rump, so that when thrown out all the neck pieces will fall one side of the table when skirted, and the britch pieces the other.

A separate boy should be employed for every two pickers-up to sweep aside the locks and bag them. When one boy performs both duties, and the board is a long one, he has not time to get back, after throwing out the fleece, to sweep the board before the shearer has caught another sheep, and then these locks get into the next fleece. The bellies and locks should be separately bagged on the board.

With regard to the skirting tables, some good advice is given in "The Pastoral Review" by a competent classer. He says:—"These are either a series of single tables, with two men to each, or one long table about 6 ft. 3 in. wide, placed at right angles to the board, and the pickers-up throw the fleece straight across. The britch pieces all fall one side and neck pieces the other, and a man sweeping on each side of the table can thus sweep britch pieces one way, say the left, to the piece pickers, and the neck pieces to the right, to the neck pickers, and there is no confusion. With a series of tables the sweeping between them is a handicap. For fast work two men opposite each other and rolling the fleece across the table will do well. There is no golden rule for rolling, unless one is going to have all the fleeces stacked in the bins and re-stacked in the bales. This custom, which is nearly extinct, is not, at any rate with present day labour rates, payable or necessary, and hardly practicable in large sheds shearing 4000 to 6000 a day. The great thing is to have the fleeces properly skirted, neither too much nor too little, and to get this work properly done nowadays is a contract. Proper skirting can only be done, if any speed has to be maintained, when the fleeces are properly thrown out. The amount to skirt off depends a great deal on the size of the flock when small flocks are being shorn; but generally speaking any flock over 10,000 can, if the condition warrants it, afford to take off the neck and britch and any ragged pieces on the sides. If the backs are dusty and wasty and the side and shoulders good, it is better to remove the backs, and have baskets to throw these into; they must not be mixed with the other pieces. If the fleeces have any tar brands on them they should be picked out and thrown in a basket by themselves. This is important, because there are still a few people who brand with coal tar, which won't scour out properly, and breaks the teeth of the machines in the woollen factory.

"With all due deference to an ancient custom, which is nevertheless wrong, have the bars of the rolling tables 1¼ inches apart. The old close-barred tables are no good, enough locks do not fall through, but stay in the fleeces; and this affects the price. Generally speaking the buyer of good fleece wool does not buy locks, and before this fleece can pass the sorters these locks must be shaken out and re-sold, which means that so much wool has been purchased at a loss. Bars are preferable to rollers for this reason. They are stronger and don't often break under the wool rollers' weight when he is enjoying his siesta at noon; but the spindle end of the roller is weak, and when broken is hard to replace. Always have old wool bales sewn round the tables to prevent the locks falling out."

We have now practically arrived at the important operation of classing, and as it is rather an intricate and extensive subject, we will discuss it in a fresh chapter.

CHAPTER XV.

MANAGEMENT OF A MERINO FLOCK (*continued*).

WOOL CLASSING AND DIPPING.

Preparing the Clip for Market—General Notes on Classing—Proper Designing of Shed—Classing Merino Wool—Fleeces—Keep every Sort Even—Skirting Pieces—Crossbreds and Longwools—Fleeces—Pieces—Lambs' Wool—Do not Overclass—Rolling Fleeces—Light Weight Bales—Wool Pressing—Dumping—General Notes on Dipping—Its Advantages—Preparing and Mixing the Dip—Keep the Bath Stirred—Thorough Immersion Necessary—Drying the Sheep—Length of Fleece in Dipping—Precautions to be Observed—Spraying or "Jetting."

There is little doubt that Australian wool growers, generally speaking, handle their fleeces at shearing in a better way than any others in the world, and their example is well worth imitating by the sheep breeder of other countries. There is naturally a tendency among small men and farmers to send their wool into the market at the lowest possible expense for preparation and get up, with the result that it is classed "anyhow," and the buyer takes a lump off his price. There should always be a man at the head of affairs at shearing with a full knowledge of the business, and the ability to utilise that knowledge for the benefit of his employer. No matter how well regulated a flock of sheep may be as regards breeding, nor how well the sheep have been bred to one good type, there will always be in that clip a little variation in quality. Some sheep are sure to produce a stronger or a finer fleece than others, and any man with a watchful eye need only stand at the board side when the fleeces are being gone over at shearing to mark the difference there is between one and another. There is the difference in length of staple, quality and condition—all of which can easily vary from 5 to 10 per cent. The careful classer knows how to turn to good account these various yet important points, and a man who carelessly consigns into the same bin all the shorn fleeces regardless of quality, length, and condition, is not worthy of a position at all. It is exactly here where careful classing comes in, and every man over the board who watches for the points here given should turn to good account every fleece that comes under his notice. As long as sheep grow wool there is bound to be a variation in individual fleeces, for not only climate and pasturage, but the health of the animal also, are stong determining factors in the production of a sound, healthy fleece of wool. So long as these conditions vary there will be a corresponding inequality in the points named.

What is the object of classing wool ? The answer is :—That the shorn fleeces should be put into their respective qualities in order to facilitate the work of buyers, and to command the highest price possible for that particular lot of wool. The object is to make a parcel uniform in quality, length and condition, and the more level, true and straight a lot is, the more likely is it to command the unreserved attention of all buyers, generate keen competition, and also secure the highest price any man can pay. Frequently a nice clip, on account of the skirting, sorting and packing being badly done, sells at a reduced price, and the grower, instead of blaming himself, accuses the broker of sacrificing his wool, and next year tries another, with no better results. Of course, a difficult phase of the situation in Australia is the inability of the small grower to get a classer to do the work, for the simple reason that any classer of average skill will not be bothered with the few pounds attached to the job. All the really competent classers are in the big station sheds. There are the second grade men, but these are nearly all absorbed by travelling plants, so the man who shears, say 2000 sheep at home, has to depend on himself as a rule. It is to be hoped that he will obtain some assistance from this chapter.

Not only must a wool classer know his work thoroughly, but he must be a "good man among men," that is to say, he should be experienced in the direct superintendence of the wool rollers, piece pickers, pressers and bale brander, and the wool should be under his unrestricted and responsible charge from the time it leaves the sheep's back till it is ready for the teamsters to cart away. Many wool classers, especially youthful ones, have little notion or idea how to handle men, and become preoccupied with the handling of the wool themselves, for which they are paid, while a scratch team of skirters and pickers of pieces are perpetrating irreparable mischief close by unchecked.

Good classing of a clip makes all the difference between a poor wool cheque and a healthy one. Often a second-rate clip presented before the trade in a first-class way commands competition from buyers who are in search of wool well prepared for market, and who want really useful material. Buyers do not want, and will not have, a lot of mongrel fleeces mixed up with straight, regular ones, and pay the price for the former that the latter are worth. As a rule, wasty, mixed fleeces bring a disappointing price, but if the lots are as uniform as possible in quality, length and condition, keen competition and the highest ruling market price can always be relied upon.

To get up wool properly the shearing floor should be smooth and level, of wood or stone, and kept well swept during shearing hours, as otherwise clippings and scraps of stained wool get rolled up in the fleeces. The bellies should always be taken off first and put into a bin or corner by themselves. No second clips should be allowed, but the wool should be closely and evenly shorn all over. A bad shearer will, by taking too large a cut, leave three-quarters of an inch sticking up on the shoulder or in shearing around the back, and then he cuts it off with a back blow. Large pieces of skin, too, are often cut off by the "tomahawker," and these have to be hand-picked by the manufacturer, or they break the delicate combing machines. When the fleece is shorn the boy who picks it up should put it carefully together, grasping it by the tail part, and not sever any portion, then throw it out flat on the table with the branded side uppermost. In many tables the bars are fixed at ½ in. apart, but with this width, as already stated at the end of the previous chapter, half the locks do not fall through, and remain in the fleeces and pieces, only the second cuts getting between the bars. A good method is to make the bars 1¼ or 1½ in. apart, and it will be found with these wider-spaced tables the pieces will invariably be bulkier and brighter. Another thing, the small second cuts and fribs will not pass through the scouring machines alone, and have to be mixed up with the board locks, which are about the size that will pass through a space of 1½ inches.

To handle wool efficiently it is very necessary to have the shed properly designed. The most important item is ample light at the beginning and end of the day, having plenty of large wool bins and good tables, and the men so arranged that the wool works forward all the time, while the classer is so placed that he can attend to his own work and at the same time see and be near to all the men and the wool-pressers.

Coming to the actual classing, we will first of all deal with Merino wool, taking the fleeces to begin with. No definite rule can be laid down as to the number of sorts to make, this depending upon the number of sheep shorn. There is, of course, a great deal of difference between classing longwools, crossbreds and Merinos, but one rule applies in the get-up of all wool, no matter what size the clip, and that is to have the fleeces more or less skirted, even to the minimum of removing only the stained pieces, and to put them and the bellies apart and bale the fleeces by themselves, even if the total of the latter only fill one bale.

The three outstanding qualifications of Merino wool are quality, length and condition. It is broadly divided into two classes, combing and clothing, the former being the shaftier or longer stapled, and the latter short stapled, but there is very little true clothing wool grown nowadays, it being a misnomer to so brand what is really short combing. Combing wool should have a staple of at least two to three inches, and, of course, should be fairly "sound," or in other words of sufficient strength to stand a reasonable strain. The term "clothing" is applied in a general way to those fleeces which are not sufficiently long to comb. An ideal clothing must have many special qualifications apart from shortness of fibre, for it is used for very special purposes. Such a wool should be from 1¼ in. to 2 in. in length, but not more, of very true and pronounced character, and of good body and fine quality. Such wools, as already stated, in their perfection are very rare and much prized. However, they hardly interest the average grower, and it would be waste of time for him to look for such in his flock, unless he has a clip which is renowned for fineness of fibre.

Expert classers differ considerably over the question of the number and designation of lots to make, but while it may be taken as bad policy to mix obviously different types of wool, there is nothing to be gained by over-classing, that is, making too many small lots. To secure good results, it is not necessary to class to the very hair, although the number of types that the Australian clip was split up into for the purposes of valuation under the terms of the Imperial Government's purchase during the war reached the astounding figure of 848. Generally speaking, in average sized Merino clips, the combings, after being separated from the clothings, if any, may be divided for quality into three big classes, which in a large clip may again be subdivided for condition. These classes should be—first the finest quality, second the medium quality, and third the strong quality fleeces, which could be branded A, B, and C combing. Then there should be one small line for all the cast fleeces from the above three lots. If the clip is a large one, the following system could be adopted, provided the sorts are really there :—

A.A.—All the bright long combing, fine quality, 66's to 70's free, sound, light in condition, good handle, dense.

A.—Similar to A.A. in quality, but heavier in condition, sound, not of such good handle.

B.B.—Long strong combing, super 60's quality, bright, free, sound, light condition.

B.—Long strong combing common 60's, sound, heavy condition.

C.C.—Short-stapled combing wools, 70's or upwards quality, dense, bright, free, sound, highly crimped.

C.—All short-stapled wools, heavy condition, harsh and generally inferior.

D.—Really an odd sort combining all canary stained and any wools too inferior to match with any of the previous sorts.

FLEECE.—All the tender and broken stapled wool. If there is a great quantity of this all the bright and best could be baled as A.A. FLEECE and balance as A. FLEECE.

In clips where there is a proportion of fleeces of particularly good length, these may be kept separate and specially branded. They should be about 4 in. in length, of good style and body, and particularly sound, as they are called upon to bear an especially heavy strain in course of manufacture. Such wools, which are generally found in medium quality Merinos, are known in the trade as " warp for re-combing," and command a high price.

It is most important to test the strength of every fleece, because what is not sound will not stand the strain of spinning after combing where it is twisted and pulled. Tender wool is put through quite a different process, being carded and spun into a yarn where the fibres, instead of lying straight and smooth and twisted tight the whole length of the yarn, are all mixed up and tangled and loose. Equally important is condition. Wool is valued on its clean yield after scouring, and two fleeces being equal in all other respects, the one that will yield the greater amount of scoured wool is the more valuable. Hence if two fleeces of A.A. quality, otherwise equal, yield 48 per cent. and 42 per cent. clean scoured wool, the higher yielding fleece would be classed A.A. and the latter A. In mulga, hot or sandy country, where the backs of the fleeces are wasty or full of dirt, remove these at the rolling tables and bale them as one sort—backs. Also it sometimes happens that with a mob of the same sheep half have been on seedy or sandy country and the others on clean paddocks, and it is necessary to separate these wools. Of course, the sheep should be shorn separately. The chief thing in classing fleeces is to keep every sort even, and have plenty of distinction between each. If in doubt with a fleece as to which of two sorts it belongs to, throw it into the lower grade.

The skirting of fleeces is a most important point, and the success or failure of a shearing may be made in this section. If, as they are at present, carbonising wools—that is, wools that have to be put through a special process to free them of foreign vegetable matter such as burrs, &c.—are in poor demand, it must be apparent that it is imperative to have the fleece as free from burr as possible, so that in burry country it undoubtedly pays to skirt fairly heavily if by so doing the fleece portion can be kept nearly free from burr. A few do not matter, but where it is distributed so widely over the fleeces as to cause more than half the clip to be put into the pieces if the fleece is to be kept free, such skirting is inadvisable, and will not pay. In such instances, the best that can be done is to remove any bad clusters of burr, as for instance, round the elbow, and also, of course, all stained and daggy pieces. In wools from "free" country, there is a tendency to skirt too heavily, and splendid wool is frequently thrown into "brokens" that should never have been taken off the fleece. Such a policy is certainly not remunerative. Where there is no burr whatever on a clip, light skirting should be the order. As much as possible should be left on the fleece, the greatest care being taken, of course, to remove the belly and all fribby pieces, sweat-ends, or seedy pieces. The foregoing applies with equal force to both Merino and crossbred.

The point now arises how best to deal with the pieces which have been skirted from the fleece. A man to be a competent picker requires to be a judge of wool of a kind. One man cannot properly pick bad stained pieces for more than five shearers. In very large sheds of 35 shearers and upwards, where the classer is constantly engaged at the wool table, a second in charge should be allowed him to oversee the pieces, necks, bellies, &c., and to give a hand anywhere it is wanted. He should go through the pieces after they are picked to ascertain if they are clean.

"Do not put too much wool on the table," is the advice given by a big Queensland classer; "stand a little aside of the pile of wool and draw the pieces across the table in front of you. Take one piece at a time; just remove the stains, if any, then take off any fribby or inferior pieces, which are called seconds, and the remainder is firsts. Always shake the pieces to rid of locks. It sometimes happens that a whole piece is only fit for seconds, being discoloured, &c., and it is just here the trouble occurs, as the average picker throws it into first on account of its size."

In a fair-sized clip there should be five lots of pieces, all told—the first pieces, the second pieces, the bellies, the stained pieces, and the locks. The first pieces should consist of the bulkiest and best of the pieces that have been skirted off the fleeces at the table, and the second pieces should comprise the remainder of the pieces, with, of course, the urine-stained bits taken out. These latter should, if possible, be dried on hessian sheets before being baled. An even better way to dry them is to erect outside the shed a framework, with the top raised a couple of feet from the ground and a sort of table made of fine meshed wire netting, which permits of the air getting all round the wool and drying it more quickly and effectively than would be possible by any other method. When dry these should be baled, and branded "stained pieces." The locks should also be kept separate. The bellies also, of course, should be baled by themselves. Some people make second bellies by skirting them, but there is nothing in particular to recommend it, especially if the bellies are to be scoured, as these skirtings contain all the best of the yolk for helping in the scouring. As to picking locks over, it is mostly a waste of money, and just as good results with less trouble will be obtained by mixing the board and table locks. These table locks are nearly always mixed at the scours with the board locks to help them through the rollers. In piece picking, it may be pointed out, the size of the piece of wool has nothing to do with determining its class; it should, but very often is not, be graded according to quality.

With regard to Crossbred or Longwool, the seven principal qualities are 60's, consisting of the finest comebacks, and are closely allied to a Merino; 58's, the comebacks of average fineness; 56's, the finest of the crossbreds, and the coarsest of the comebacks; 50's, an average half-bred; 46's, ordinary three-quarter-bred; 40's, the finer Lincolns and Leicesters; and 36's, the coarser Lincolns. Very few growers have the facilities for classing to quality, hence the expedient is adopted of blending two or more qualities in the one lot. There is not the slightest objection to this practice, provided that the qualities are judiciously blended. For this purpose 60's and 58's can be advantageously blended, or 56's and 58's, but it is madness to blend 50's with any of these qualities, as it is altogether a different type of wool. With very small farmers' lots, made up of every cross and type, there is practically no scope to class the fleeces, and the best thing to be done is to get the taggy or burnt ends removed, bale these as pieces, bellies and the balance as fleeces, with perhaps two lots of fleeces if enough to warrant it. With a farmer's flock of, say, 2000 crossbreds, together with his Longwool rams and ewes, if any, the rams and Longwool ewes could be baled separately with just the stained removed and the bellies kept separate, and the fleeces marked R. and E. Lincoln, or whatever the breed, and the crossbred fleeces graded into first and second, according to quality, condition, colour, &c., the finest and brightest being first, and the pieces picked over to remove the stained, and then a belly lot.

In large station lots of crossbreds, and where there are often many comebacks, the qualities could be ranged somewhat this way:—56's to 60's branded Comeback, 52's as 1st XBD., 48 to 50's as 2nd XBD., 46's as 3rd XBD.

If a very large crossbred clip, say, 20,000, it would probably be advisable to make the following sorts:—

A.A. CBK.—Being all the finest, freest, brightest, and longest.
A. CBK.—Anything heavier in condition or otherwise inferior to A.A. CBK.
A.A. XBD.—Longest, brightest, finest, best of the crossbred.

A. XBD.—Any wool heavier in condition, but of same quality as A.A. XBD. 52's.
B.B. XBD.—48 to 50's quality, stronger and shorter.
B. XBD.—46's quality, all inferior crossbred fleeces, and dingy.

Any qualities below these counts are Lincolns or Leicesters, but these and any pure breds can be shorn separately, and baled under the name of their own breed. Any black or spotted wools of any breed are always put aside, also fleeces of two years' growth or more ; these are branded D.F. (double fleece).

With crossbred pieces, it should be sufficient in the average sized flock to make first, second and stained. In small clips the pieces and bellies, whether free or burry, may be advantageously blended together and branded as pieces and bellies, though in the larger clips it is as well to keep bellies and pieces separate. Crossbred locks should be treated the same as Merinos.

In regard to Merino lambs, this wool is used for special purposes, and as the presence of a very small quantity of burr or seed necessitates the wool being carbonised, which considerably reduces the price, it will be seen how imperative careful picking is. In a fair-sized clip Merino lambs should be made into three sorts, the first containing the longest staples and being free from seed ; the second the smaller bits, the seedy skirtings, and the britch ends ; and the third the locks and stained pieces. It is, of course, just as necessary for crossbred lambs to be as free from burr as Merinos. In conclusion, it may be pointed out again that it is not good policy to overclass, *i.e.*, to split clips up into an unnecessary number of small lots, which do not attract as keen competition as the large lots do. The classer must strike the happy mean, and fancied variations as to condition should give way to the advantage of securing a good-sized parcel, sufficiently even in length and quality.

Rolling fleeces is a thing that is often badly done. It may seem a simple enough operation, but as with everything else in life, there is a right way and a wrong way. Two men should stand, one on each side of the table, and after skirting should proceed as follows :—The man on each side of the table picks up the fleece where the diagram is marked X, places the back and sides on the shoulders, and the britch on top of back and sides. Then throw the neck over on top and roll (not with pressure) from XXX twice, the man at XX covering the fleece with wool at his side of the table, then turning round and placing on the classer's table. This method of rolling is much quicker and easier than rolling fleece from britch to shoulder, and shows off the fleece better. Do not tie up rolled fleeces with binder twine, or even sewing twine. Bale them merely rolled, and rolled not too tightly. Never pack crossbreds and Merinos together. Sometimes when only two or three crossbred fleeces are in the whole clip one or more may appear when the buyer is examining it, with the result that he will value it as mixed all through, and the price will be ½d. or 1d. per lb. less.

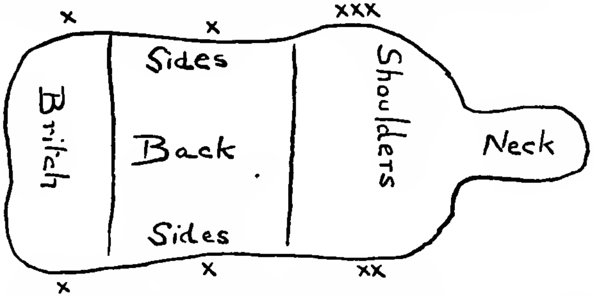


Diagram to Illustrate Correct Way to Roll a Fleece.

Wherever possible light weight bales should be avoided. Of course, in the case of cull fleeces and skirtings, light weights are sometimes unavoidable, and it is better to make a light weight than to spoil the fleece lines by the inclusion of inferior wool. Have all the bales shaken and brushed on the outside and all loose ends removed ; then turn them outside in and press this way ; there is less loose fibre on the outside. Brand the bales clearly on both sides in bold letters in the following order :—Brand or name of station, contents, class of sheep, number. Do not number or brand the ends of bales, as these are reserved for shipping marks.

A few remarks on wool pressing and dumping may not be out of place here. There are several makes of wool presses, differing in detail, but the type most favoured is made of thoroughly seasoned timber, and the portions subjected to pressure are uniformly strengthened by means of steel bars and straps. The top box is hinged to side brackets and turns down, so that all the filling is done on the floor. When both boxes are filled with wool, the top box is raised into position by a hemp rope working over a jib on the crossheads on to the fuzee. A wire rope or chain (by means of pulleys) is used for applying the pressure to the ram, the shaft of which is of timber about 4 inches square, and has a steel plate fitted to the end.

The ram is held in its position by a pawl, which drops automatically into position, and is released by pulling a cord when ram is lowered or raised Special fasteners hold the pack in position, and the locking and unlocking of the doors are effected simultaneously by means of vertical bars. When the wool is brought down to the pressure required, the doors are opened, the pack fastened up, and the bale released by raising the latch which holds the hinged side of bottom box. This allows the side to fall back, and the bale is turned out with ease. The above describes a wool press worked by hand, but large stations have similar presses geared and driven by a belt from an engine.

When the bales reach the wool stores they are further compressed or " dumped," to conserve shipping space. Prior to 1914 the wool was mainly single dumped, *i.e.*, each bale dumped separately, but when the war broke out, owing to the serious shipping shortage, it was found advisable to double dump, *i.e.*, dump two bales together, as far as practicable, in order to save still more space. In double dumping, a pressure of 3300 lbs. to the square inch is used.

Summed up, the advantages of this process are :—

(1) It conserves an enormous amount of space in the vessels' holds, and facilitates handling.

(2) Considerable labour is saved in ships by stevedores through double dumping, as with single-dumped wool only, the wool has to be screw-jacked into the holds to get the best results, whereas with double-dumped bales the screws are not often required for stowage.

(3) When wool is dumped, it is easier to handle for transport, and takes up less storage space when awaiting shipment.

Badly packed bales, or "sowdows" as they are called in the trade, mean a loss in several directions. Many men in a small way are inclined to be satisfied with throwing their wool into the pack or container, which is generally held up by a few pieces of timber, pressing the wool down the sides with a spade and then trampling it down. If more attention were paid to the packing of these small lots of wool, it would be better for the grower, as a sowdow when shown for valuing purposes does not look as well as a uniformly pressed and nicely got up bale, and the buyer—either consciously or unconsciously—is influenced by the way the wool is offered for sale, and the appearance of the bale.

The following details will emphasise the loss of space caused by sowdows for the season ending 30th June, 1918, in Victoria alone :—During this period there were approximately 66,000 bales of sowdows out of a total of 500,000 bales offered for appraisement. Of this total, 40 per cent. were sent to be reclassed or scoured, and the balance, 39,000 bales, sent for shipment. Allowing a conservative estimate of 3 ft. of space per bale lost in stowage, this equals 117,000 cubic feet, or equivalent to 8000 bales of wool space lost from Victoria for one season only. This means a considerable economic loss, especially when freights are high. It is obvious, therefore, from the foregoing remarks, that slovenly packing is opposed to the economic handling of wool, by reason of the extra space occupied in transit and stowage.

DIPPING.

Following shearing and classing, we next come to the very important business of dipping, the main object of which is preservation of the sheep from insect pests. Some sheep owners realise not only the importance of dipping, but also the importance of those conditions which are essential for successful results. Others, however, give little or no thought to the subject. The majority insufficiently appreciate the benefits derived from dipping, and only dip under some form of compulsion. They rush the work through, not so much to achieve the most profitable results, as to have done with the job. Now, it is curious, but true, that as sheep increase in a country, parasites keep pace with them, and but for the safeguard of dipping, sheep farming would, in many localities, become unprofitable, if not impracticable. The advantages of good pasturage and of high-bred flocks would be nullified by the depredations of the parasites, for the fleeces of sheep afford ideal protection to insects. Moreover, wool is a most sensitive product, and responds to its environment as a barometer does to the atmosphere. Tick stain is only one item in the havoc done by insects. The worried existence led by sheep which are constantly tormented by ticks, and especially lice, reacts on and seriously depreciates the quality of the wool and the condition of the sheep, and especially of lambs.

Now, it may be definitely asserted, that as well as being a deterrent of the blowfly, as will be shown in a later chapter, dipping, if the proper materials are used, and the work is properly done, is one of the most valuable investments that any owner of sheep can make, as it is beneficial alike to the condition and the growing fleece of the animal. It gives returns which more than compensate for the trouble and expense incurred, and once faithfully tried will always be used ; for when a sheep-man gets to use a certain dip as effectively as he should, it is then that he appreciates the results the most. Dipping does not make wool grow where none grew before, but it keeps the skin healthy. A healthy skin grows a healthy wool, and the sheep's life is spent in feeding and sleeping, instead of scratching and biting itself.

One occasionally hears the arguments that dipping renders the wool harsh, stains it, and weakens the fibre. In the old days, when preparations were crude and lime and sulphur dips were the main articles on the market, there may have been good reason for this cry of "harshness," for the astringent and perishing effects of lime on all soft materials are well known, but given a good reliable and proved dip of present-day manufacture, properly prepared and efficiently used, there need be no fear whatever about the wool being injured in any of the ways described. As bearing this out, a very high authority may be quoted in Mr. S. B. Hollings, the well-known Bradford wool expert, and special correspondent of "The Pastoral Review," who says:—"I hasten to combat such a silly notion as that dipping produces light fleeces. . . . I can easily conceive when crude preparations are used as dipping materials, say, for instance, lime, crude arsenic, sulphur and carbolic acid, that these have a prejudicial effect on the skin, causing the skin not to perform its natural functions, the tendency being to lighten the subsequent growth of wool. I have never yet known a single case where a good proprietary dip, particularly of the arsenical class, was used, that it has not had a wholesome and beneficial effect upon the skin, and I cannot, for the life of me, understand such a dip causing the growth of a light fleece." This refutation should at once settle any argument regarding injuries to the wool arising from dipping. Thousands of sheep owners have reaped the advantages of the operation, and "The Pastoral Review" itself, a leading authority on matters connected with live-stock management, has ceaselessly urged a more general application of the principle.

Sheep dips consist of arsenical and cresylic acid preparations, and each class has its advantages, though the former are more favoured, chiefly from the point of view of greater lasting qualities. The practical value of dip depends not merely on killing the insects that are alive at dipping, but on the length of period which it can afterwards protect the sheep from reinfection. This vital point, for it is of primary importance, is frequently overlooked. Even arsenical preparations vary individually in their lasting properties. One criterion for guidance is their relative solubility. If a dip is rapidly soluble in the mixing, and the whole of its composition at once disappears in the solution, it may be taken as probable that it is wanting in lasting effects. Sheep owners should therefore, for their pocket's sake, prefer dips which mix slowly to those which dissolve quickly. This subject only requires thought to make its true practical value evident. Fortunately, it is neither arduous nor expensive to find out the most efficient preparation. The accumulated experience of previous use is a sure guide. Preparations, for instance, which have stood the test of many years of general use, and still retain a leading position, have in that fact alone an unerring credential.

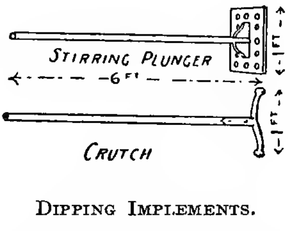
Dipping baths, with accompanying yards, &c., have already been fully discussed in an early chapter, and taking it for granted that the sheep owner has selected a reliable arsenical dip, we will now go into the essential points of the operation. First of all, however, we must emphasise the paramount necessity of care and thoroughness. To mix the dip hastily, pass the sheep through the bath in a haphazard style, and dry them under any old conditions, is not proper dipping; it is making a farce of the job, and methods such as these generally explain the poor results obtained. To begin with, we will take mixing in the case of a powder dip. This is a most important matter, and it should never be left to an unreliable person. It is not only necessary to measure accurate quantities of powder and water, but it is absolutely necessary to see that both are properly combined. Time devoted to mixing will be well repaid.

The best method is to procure about 8 or 10 kerosene tins, or 5-gallon drums. Beat packets of dip smartly before breaking the paper wrap, and empty one packet of powder into each tin or drum. Then pour very little water on to the powder, and stir thoroughly, gradually adding water until the mixture is of the consistency of porridge. Rain water or soft water should be used if obtainable. This work should not be left until the last moment; it well repays any trouble devoted to it. The best results are obtained if this preliminary mixing is done two or even three days before the dip is required, as the mixture is then in a soft creamy state, which blends readily with the water in the bath. Give the mixture a stir occasionally, and while this is going on carefully measure the water into the bath, permanently marking the level of each 100 gallons on the side of the bath, and also on a measuring stick. It is foolish to merely guess the contents of a bath. On the morning of dipping add more water gradually to the creamy mixture in the drums, until they are three-parts full, and stir vigorously. Then pour the contents of the drums into the bath through a strainer to prevent undissolved lumps going in. Stir the bath thoroughly, and if the number of sheep to be dipped will necessitate replenishing the bath, at once put a packet of powder in each drum and repeat the process above described, allowing the powder to soak until required.

Having mixed the dip in this way, and having accurately measured the water and taken every precaution that the bath is the right strength, the wash is in perfect condition to receive the sheep. But the need for care has by no means ended. Before putting the sheep into the bath it should be stirred from end to end most thoroughly, right from the bottom, and this stirring should be most carefully maintained throughout the whole operation of dipping. It should not be relaxed in the least if the best results are to be obtained. The particles of dip are held in suspension in the water, and if stirring is neglected in any way the bulk of the dip sinks to the bottom, where it is not only wasted, but becomes an increasing source of danger to sheep as the bath gets low. Stirring should be continual, and only a good reliable man should be trusted with this job.

Having carefully mixed the dip, and having arranged for continual and thorough stirring, two of the essential details have been attended to. Now comes the all-important matter of immersion. It is not merely sufficient to pass sheep through the bath of correct strength. Care must be taken to see that the sheep is thoroughly saturated to the very skin. Remember that the dip has to contend against the greasy nature of the fleece and skin, and it must be allowed time to do this. This is where soft water helps so greatly. If rain water is used the wetting power of the dip is very much greater, and saturation is quicker than if the water be hard. So many dipping operations fail on account of insufficient immersion, often due to the hardness of the water. Hard water has not the penetrative power of soft water, therefore the quality of the water should be taken into consideration when attending to this matter of immersion.

The sheep should be examined to see if the dip is getting right to the skin; if not, they should be allowed sufficient time in the bath to ensure this being done, and, if necessary, carbonate of soda or common washing soda should be added to counteract any hardness of the water, although not too much should be put in as it is liable to make the wool harsh. When sheep are passing through the bath their heads should be pushed under the surface at least once, and a crutch for this purpose and for checking them, as well as an implement for keeping the bath stirred, are shown in the accompanying cut.



DIPPING IMPLEMENTS.

The sheep having been put through a carefully-prepared bath of correct strength, and stirring having been thorough and continual, a good deal has been done towards ensuring success. But there is still another vital point to be most carefully attended to. There is a vast difference between drying sheep in the sun and in the shade. The attention devoted to mixing, stirring, and immersion is going to be largely nullified if the matter of drying does not receive equal care. After thorough draining the sheep should be placed in a shady paddock, close to the yards, or in the woolshed, until they are quite dry, and care should be exercised to see that they are not over-crowded. If sheep are allowed to dry in the sun, they will probably scald, and certainly the moisture will dry out of the dip before it has time to distribute itself evenly down the staple from tip to skin. On the other hand, if the sheep are dried in the shade, the evaporation of moisture is slower, and it enables the dip to evenly cover and adhere to the full length of the staple, yielding infinitely more lasting results.

If sheep were run through pure water, they would scald under certain conditions, so that it is not difficult to grasp the risk of turning sheep soaked with arsenical poison out into the sun when wet. There is not only danger from the sun—the risk of turning wet sheep out is equally great if rain should fall. Heavy rain falling upon newly-dipped sheep, before they are dry, is almost sure to scald them, and perhaps cause mortality. The explanation is obvious. When sheep leave the draining pen the dip should be evenly distributed between the staple and the skin. If the dip has a chance to become quite dry, it adheres to the staple, and subsequent rains only carry it down by degrees, as it were. But if heavy rains fall on sheep wet with dip, the particles which should adhere to the wool are carried right down on to the skin, which thereby gets an overdose, and if the pores should be open, as is often the case in close weather and during thunderstorms, or through the sheep being driven, scalding, even mortality, is nearly sure to occur. Instances can be quoted of sheep having been killed after being turned out into the rain while wet with arsenical dip. These could easily have been avoided if the above facts had been thoroughly understood, because no sheep owner would, with full knowledge of possible consequences, take such risks. If at all possible, avoid driving the sheep any long distance until two or three days after dipping.

There is another point of importance—and it applies particularly in regard to protection against blowfly—viz., the length of fleece carried at dipping time. The point will be discussed more fully in a later chapter, dealing with the fly pest, but it may be stated here that as protection from ticks and lice, and also from fly, depends entirely *upon the quantity of dip the sheep carry out in their wool,* it is obvious that if a sheep carrying two or three months' wool is thoroughly soaked with a *correct* mixture, it will derive far greater protection than if it were dipped—ever so carefully—off shears, or with only two or three weeks' wool on. There is a good deal of difference of opinion upon this question of the safety of dipping in long wool, and there is undoubtedly some risk. Possibly the condition of the sheep before and after the operation has a lot to do with the effect the dip will have upon the wool, and if they are in good thriving condition before they are dipped, and are kept thriving after, no ill effects may result, as the fibre is kept moving upwards. If, however, the sheep are poor before and after being dipped in long wool the growth of wool is slow, and it takes very much longer for the fibre to get away from the skin, upon which a good deal of the dip becomes concentrated. However, it may be said that there should not be much danger in dipping in long wool, provided the sheep are thriving and are allowed to get into a cool state before going into the bath, also if the matters of mixing, stirring, immersion and drying are carefully attended to as outlined above.

Sheep should never be dipped in the heat of the day. The most successful results are secured by starting at sunrise, and knocking off at 9 or 10 a.m. at latest. If any dipping is resumed that day, it should not be till the cool of the evening. Wet weather should be avoided if possible. It is distinctly advisable to conduct the drainings back to the entrance of the bath, and not let them run into the exit, as is so often the case. If the drainings return to the bath at the exit end, there is an accumulation of filth, which gets on the sheep's backs as they emerge, and it is liable to cause more or less harm. Have the draining pens covered if possible, and see that they are not too crowded when draining. It sometimes happens that sheep exhibit signs of scald on the sides after dipping. This is often due to packing them into the draining pens, especially if they are in prime condition. The reaction after the plunge in cold water sets up heat, which opens the pores of the sheep. If they are packed together in the draining pens the continual rubbing works the dip, as it drains down the sides, into the open pores, and scalding is the result. The same thing applies to driving sheep in the heat immediately after dipping.

Do not let sheep just dipped get on to grass before they have dried, or the next lot of sheep that come along may have a death roll. Neither allow the rams to join the ewes after dipping till the ewes have dried ; the same applies with the lambs and their mothers. See that sheep do not have access to a yard in which there are drums of dip in solution, and it also should be remembered in dressing sheep with powder dip to prevent fly strike, that the preparation is very strong, and there is a risk in using it after the sheep get in a very bad state owing to the danger of arsenical poisoning.

In conclusion, a few brief and all-important hints may be given, summarising the instructions contained in the foregoing.

1. Mix the dip in drums (if a powder preparation is used) at least 24 hours before using.

2. Keep the dip constantly stirred. This is *most important.*

3. A scum consisting of grass seeds, droppings, bits of wool and other foreign matter is constantly arising. Skim it all off the surface as soon as it appears. Best method is with a stable or bass broom.

4. Never hurry sheep through a dip. Some cannot swim as fast as others. Give them plenty of time. They can swim a good distance in one minute, which is long enough to be in the dip.

5. Have a man to assist the sheep at the exit of dip. Many a low-conditioned sheep is injured for want of a little help at the exit.

6. Give them plenty of time to drain in the draining pens.

7. As soon as the sheep are counted and out of the draining pens, put them under cover. If there is no shed handy to the dip, make one out of boughs, tarpaulin or any old thing handy; but cover them and leave them covered till evening. This allows the dip to soak into the sheep, and retain its virtue on the skin. The old way of turning them into the yard and letting the hot sun dry them is obsolete and dangerous; by doing so is lost the virtue of the dip, which is evaporated in a few hours. This is one of the main points to ensure the success and objective of dipping.

8. Never drive sheep while wet with dip. Better to hold them under shady cover.

9. The mixing of dip should always be done by one man. Be very careful to note every tank of water that is added to the bath, and add dip in similar proportions.

The spraying or "jetting" principle, though in reality a form of dipping, and therefore entitled to a place in this chapter, is so peculiarly a method of blowfly prevention that it is fully discussed in the later pages devoted to that subject.

CHAPTER XVI.

MANAGEMENT OF A MERINO FLOCK (*continued*).

SHEEP CLASSING.

General Notes—Adopting a Standard—What constitutes a Good Ram—A Typical Ewe—Evenness—Culling—Crossbred Lambs from Cull Ewes—Culling for Age—Classing Yards—Judging a Sheep's Age by its Teeth—Differences of Opinion—Condition of Teeth largely Dependent on Feed and Soil.

In the up-keep of a flock—the standard of which is very largely made or marred by good and bad classing—it is essential to know clearly the importance and necessity of the work. It is a branch of the year's work on the property that is often neglected or badly done, and it would be a bad state of affairs for many owners if they had not the very excellent yearly draft of flock rams to depend upon from the various ram breeders. It is due to a very great extent to the purity and high quality of these rams that a great many flocks have reached their present level. How much further ahead would they be if, in addition to the benefit derived from these rams, the ewes had been consistently and expertly classed? That it pays to class and keep on classing can be proved without any shadow of a doubt. There are many good professional classers, but every manager should be able to class his own sheep, or at least learn to do so. With fair ability, experience, and by seeing sheep culled and classed both for sale and breeding purposes, he will not have much difficulty in making a satisfactory job of it, provided he takes an interest in the work.

Take the Merino sheep in its primitive state. It is a hardy animal, carrying a light fleece of uneven quality. Man comes along, and by selection succeeds in turning the Merino into an animal of far greater commercial value than it was in its primitive state. He does this by mating carefully—that is, by mating the good and culling the bad—in short, by careful classing. Every sheep-man who has built up a good flock from small beginnings is aware of the unevenness that exists even among sheep descended from one pure strain. There is great variety among the sheep themselves, and there is more or less variation in the fleece that each individual sheep carries. The best quality of wool is generally found on the shoulder and along the ribs. It usually deteriorates along the back, both as regards length and character, and it becomes much coarser down the breech, and in poor quality sheep peters out almost altogether on the belly and points.

Now the main object should be first of all to class and mate the sheep so as to obtain as even a type of wool as possible throughout the flock. Experience will tell whether fine, medium or robust wool is most suitable for the particular climatic conditions under which the sheep are to be bred, and experience will also tell the most profitable limit as regards length of staple. Having the right type of wool fixed in the mind's eye, the grower, by the process of selection, then endeavours to get as much of that type of wool as he can throughout his entire flock, and he also tries to get as much as he can of it on every individual sheep in the flock. He should endeavour to lessen the difference between the quality of the wool on the shoulders and on the breech, and work to spread the shoulder quality of wool as much as possible over the whole sheep. This can only be done by selection, and selection absolutely depends upon careful classing.

Classing is really a study of and guiding the development of a breed, keeping continually weeding away all such as show most divergence from the type of animal that is the breeder's ideal, and breeding by pairing together those most favouring his ideal, keeping a constant watch to preserve constitution and vital energy. Culling is really the word for what is generally termed selection in high-class animals. It might be imagined that the term "culling" applied to first-class animals gives an impression that they must be faulty, consequently the more complimentary word "selection" is used. Animals culled out from high-class stud herds or flocks may be much superior to ordinary bush stock of the same type; nevertheless, they are culls, though not debarred from breeding, in exactly the same sense as the culls from ordinary stock are culls when thrown out for sale or fattening.

Culling is the persistently discarding entirely from breeding as studs all animals showing undesirable qualities, such as an insufficient or uneven supply, or want of quality in the commodity that the animals are cultivated for the production of, but most especially those showing want of symmetry, and consequently want of constitution. In overstraining to produce special economical conditions, such as amount and quality of meat or wool in undue proportion to the rest of the animal functions, we are apt to overlook formation, symmetry, and constitutional vigour, which, above all other qualities, ought to be the essential principles in breeding.

highly improved stock. From neglect of breeding for constitution, we find some very breedy but weedy animals, showing what is often termed "great quality," but narrow-chested, knock-kneed, delicate creatures.

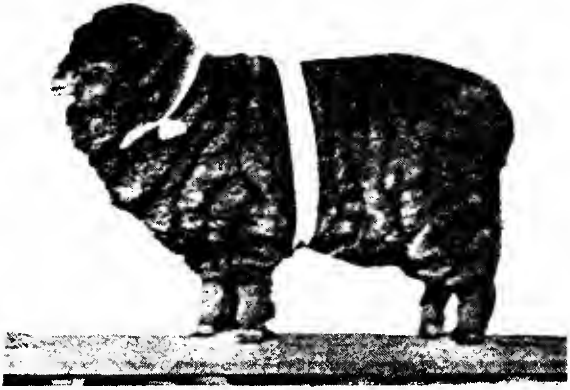
To class successfully, in the first place it is imperative to be fully conversant with the fundamental factors which constitute a good sheep. Moreover, a standard of excellence must be clearly defined. Then, having determined it, an examination of the animals must be made with a specific object in view. This is an all-important point, and according to the attention given to it, so definite or indefinite will be the impression in the fashion of one's work. A desirable Merino ram should be of masculine type, bold appearance, with thick, well-shaped horns, set not too close to the head. A thin, flat horn denotes some defect of constitution in the ram, and should be carefully avoided. The nose should be wide, eyes clear and bright, and the head set well above the shoulders. The face should be open, and the eyes free from wool. Bones should be strong and big, and the legs set well apart. The shoulder-blades in a ram should be wide apart, body long, with a good level top, deep girth and well-rounded barrel. Knees too close together and cow-hocks are serious faults. The chest should be deep and wide, with a couple of large, evenly-placed and evenly shaped neck folds. Wrinkles on the body, shoulder, and over the rump near the tail should be eschewed, although, as previously stated, increased density may be worked into an open-woolled flock by using a sire with a little fold development on the body. For the beginner, however, it is somewhat risky. Coming to the wool, open the fleece down the centre of the back, on the shoulders, and compare it with the wool down the hind-quarters, belly and inside the thighs. Look to the wool on the ribs, and remember that evenness in quality all over is most desirable. Good quality, good length and density are equally desirable, together with bright, robust, clean wool, not showing too much yolk.

Size is a point often overlooked by men anxious for weight of fleece. Even breeders of longwools, where carcase should be the main consideration, have in many instances overlooked some of the best attributes of their breeds in favour of fleece only. Merino men should take warning, and remember that big, well-shaped, evenly-covered sheep, free from body wrinkles, are the most profitable sheep to breed. A. L. Morrison, one of the best known sheep classers in Australia, once wrote :—"Frame and constitution are the first things to be desired in a flock. Without these, decent results can never be attained."

In the case of the ewes, generally speaking, the grower should aim first at excellence of frame, and a good type of sheep to hold in the mind's eye when classing is one with a large frame, big fleece, even in type, and fairly dense, with long, soft, bright wool of good character, comparatively free from yolk or tip, and without sign of body or tail wrinkles. The mouth should always be looked at, and if it is failing, the ewe should be culled. As long, however, as the mouth keeps good, and there is some special quality, or any other good reason for keeping it on while the mouth lasts, it may be profitable and advisable to do so, a good mouth being an indication of strong healthy constitution, in addition to the individual having the power of nourishing itself properly, which one with a bad mouth has lost, however many good qualities it may possess. When a healthy, strong ewe, of full mouth, begins to fail, it will usually be found that the mouth is going ; and the teeth go off very suddenly sometimes. Ewes that are barren or have not bred well always compare favourably in appearance with regular breeders, but it is not advisable to keep such in a breeding flock, as they take up the room of breeders, and are comparatively too strong and inclined to be wild and rowdy. Fecundity being hereditary, it is well to select as breeders such as show a disposition to breed regularly and readily, so that those inclined to be non-breeders, unless showing some very high qualities, making them worth keeping for the chance of a lamb, ought to be culled, and they will add to the appearance and value of the cull flock.

Typical Examples of Good Merino Ewes.

Where classers cannot afford to go deeply into the weaners, evenness must be the first consideration. Small, ill-shaped, wrinkly sheep should be discarded first, to be followed by sheep out of proportion to the others in size, including the light, open-woolled sheep, and those with light, wasty wool underneath. Some classers favour a number one flock to include all ewes showing qualities above the ordinary flock standard, and joining them to the best of the rams in order to establish an excellence to be aimed at generally. The leading professional classers as a rule favour comparatively light classing of weaners, the necessity for a second classing at two years old being recognised. Sheep showing some of the best points at one year old are often very disappointing at two years, and sheep one may be inclined to cull as weaners often show wonderful improvement in the second year—so much depends on the season. Rigorous culling of defective rams is, however, the main consideration, and no care in classing can make up for the mistake of using faulty sires.



A TYPE OF MERINO EWE NOT TO BREED.

Culling must be specially directed to breeding ewes, and the maidens should be classed as late as possible before joining rams to get the benefit of age, and as near full fleece as possible Take out all badly-shaped cow-hocked ewes, kempy faces, weak backs, devil-gripped, bad-woolled, small-framed, etc., and after classing, run the sheep past to detect any cow-hocked ones or other deformities missed. Very much more depends upon the judicious selection of females than is generally supposed in attaining a decided workable type of animal. Some men are inclined to think that by buying valuable sires, and scattering their acquired qualities promiscuously over a nondescript lot of females, they will permanently improve their flocks. Such is culpable waste of good blood.

On large stations running Merino flocks, for which rams are purchased yearly, and where the wool clip and the fat wether are the objects, nothing further than culling the ewes yearly is required, no mating or selecting ewes for certain rams being necessary. The usual percentage of culls that requires taking out in ordinary flock maiden ewes is roughly as a rule 25 to 30 per cent. As the flock improves, the percentage drops to about 20, and the standard of the cull improves. At this stage, it sometimes pays to cull into three lots—first flock, being retained for station use: second flock, for sale: and the balance, about 5 per cent., culls to be got rid of for what they will fetch. These culls of the culls, no matter what the sex, should, as a matter of fact, go to the butcher. Small owners too frequently buy cull ewes from their big neighbours, with the worst possible results, perpetuating evils that should have ended in the killing yards.

With young cull ewes of fair quality, if a very good season and a netted paddock is available, and one can hire some long-woolled rams, they could be joined and the crossbred lambs would give a good return. Then the ewes should be sold for the best current price offering to make way for the next lot of culls, which could be treated in the same manner if everything were favourable. If at all dry sell the culls at once and so save the feed for the valuable breeders. The crossbred lambs should be disposed of holus bolus as soon as six or nine months old, as it does not pay, except where all the place is securely netted, to have crossbred sheep running where a man is trying to breed Merinos.

The whole secret of breeding up a flock to an even, uniform type, is to keep culling as far as is possible all sheep not conforming to that type. Supposing a big, plain-bodied sheep, with medium combing wool, big-boned, on high legs, and with clean open face is the type aimed at, and that a breeder's flock of ewes, after culling, contains a mixed type, then by yearly culling and consistently buying year after year big plain-bodied, robust combing rams of a recognised type, it follows that the ewes that conform to this type are still further improved, and those that are backward should throw, with exceptions, a lamb a little nearer to the desired standard than themselves; these lambs, in course of time, being again mated with rams brought from the same stud flocks, the type is still further improved, and the blood yearly becomes purer, until with effluxion of time the desired standard of excellence is arrived at. Above all things, buy rams to suit the country they are going to, and once having obtained them, they should be persisted in; nothing retards the successful building up of a flock so much as buying rams from various strains.

To a certain extent a mistake is made in culling for age by earmark. Under this method the oldest mark is yearly sold. On examination it will be found that many of these sheep are perfectly sound in the mouth, good limbs and fleeces, and quite capable of having another lamb or two. On the other hand many of the ewes in the younger age marks are faulty, having developed defects, or not having developed as was expected at classing. A method that has been tried with success is, after the classing of the maiden ewes, to get in all ewes from 6-tooth upwards. Go through these sheep with a raddle stick and reject everything in any respect unsound or defective. By this method the broken or faulty mouthed, lame, cancered, bad-woolled sheep are eliminated, and the remainder left on the place are good and sound. This, coupled with yearly classing of the maiden ewes and rams, and consistently buying rams from one strain must improve the sheep.

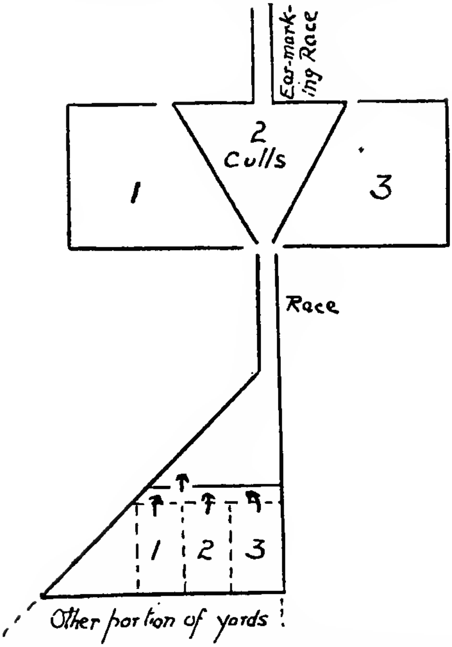
It may be pointed out that the resultant culls are mixed ages and hard to sell, but granting this is so, the lower price obtained for the cull is more than compensated for by the improved all-round quality of the ewes retained.

In these days of fly it is very important to get the sheep up on high legs, wide in the crutch, free from wrinkles, except neck folds, and rams with horns not too close to the head.

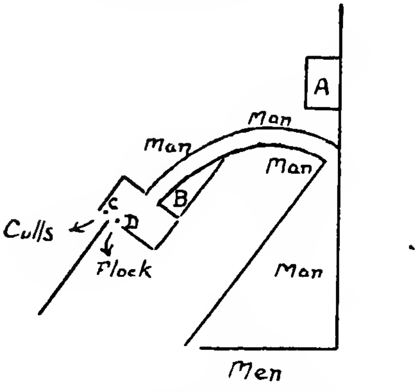
One must breed to suit the country, but a great many people try to put too much weight on the sheep in the hot districts, with disastrous results from flies and small lambing percentages. A sheep has only a given amount of vitality, man cannot increase it, and a happy mean pays best in the end.

The plan of classing yard for culling (p. 259) is recommended by a practical classer and breeder of experience. Put temporary hurdles where dotted lines. Fill up 1, 2, and 3; the classer gets in 1 and raddles any culls; the races being narrow he can examine any sheep in doubt. When 1 is finished he proceeds with 2, and 1 is run off through the race, and by the time he has finished 3, No. 1 is full again, and 2 and 3 being run off, so there is no delay. The culls can be run up the branding race and ear-marked. A lot of sheep can be handled this way in a day.

If sufficient labour is obtainable, however, better work can be done by handling each sheep. A special pen for this is shown in the sketch on the next page. The race is very narrow, so that sheep cannot turn: six men are required altogether. The classer sits on stool at C, and the catcher sits opposite him. The classer ear-



PLAN OF CLASSING YARD—RADDLE STICK—BEING PORTION OF ANY STATION YARD.



A & B Decoy Sheep

C - Classer D- Catcher

CLASSING YARD—CATCHING EACH SHEEP—BEING PORTION OF ORDINARY YARD.

marks the culls. Let each man do half an hour on the catching stool, and then go to the back of the yard and work up. The pen must be very small, holding about six sheep, the idea being to catch sheep as they come in, and leave six sheep in pen alone. 5000 a day can be handled this way if good men are available and the yard is properly angled.

It has been stated that every owner or manager of an average flock should be able to class his own sheep. So he should, but unless he feels definitely that he is on the right track, and is satisfied with the progress his flock is making, he should certainly employ the services of a competent classer, allow him to buy the right rams, and yearly attend to his classing. The small fee paid to the classer would be returned many times in the increased value of the flock.

By way of summary, it may be said that by culling females fairly close and judiciously mating them with good rams having much the same style of wool (supposing always that something approaching an even, decided style has been attained, or that at least the breeder or guiding mind has a definitely fixed ideal that he is aiming at), it is wonderful how soon an improvement will show. When it is calculated how much the increase of a few ounces of wool on each sheep, together with a penny or two per lb. in increased value of wool through the improved quality, will swell the profits on a large sheep run, without increasing the cost of production, the advantages of culling closely will be evident.

SHEEP'S TEETH.

At this point, it may be useful to the beginner—in fact they should have been given earlier—to have a few hints regarding the judging of a sheep's age by its teeth. Sheep have thirty-two teeth, as follows:—Incisors eight, which are situated in the front on the lower jaw only, and molars six each side on both jaws. They nibble off the grass with the front teeth, and pass it on to the molars or grinders, to pulverise slightly before it passes into the rumen. This food after a time, and when the sheep has satisfied its hunger, returns to the mouth to be cudded (ground up into fine particles), and is then passed into the second stomach to undergo the process of forming the material that makes for growth, fat, wool, &c. This, however, is getting away slightly from the teeth, the front ones of which indicate the age. It is unfortunately impossible to lay down a hard and fast rule as to the number of teeth sheep should have at certain ages, as instances are common in which variations occur. Ancient usage has it as a fixed dogma that the sheep acquires two fresh front teeth each year, until it is four years old, but it frequently happens, especially in cases where they have done well, that sheep will have eight teeth at three years. The ordinary and commonly accepted rule is that when a lamb comes into existence it has eight rudimentary teeth called milk teeth. When it becomes about 15 months old the two middle ones of the incisors are pushed up, and at about 18 months two big teeth become well defined. This is called a two-tooth, or one-year-old off. After a time the milk teeth on either side of these two permanent ones are pushed up in the same manner as the first two, and at about 2 years and 3 months old the sheep has four big incisors. This is called a four-tooth or two-year-old off. The same process goes on, six big incisors come into being, and we have a six-tooth or three-year-old off; then in the same manner eight teeth come, this being called an eight-tooth or full-mouthed sheep, having all its permanent incisors. The sheep is now four-year-old off, that is, it is a little older than the teeth indicate, and for ordinary flock sheep the above is sufficient to tell the age for most practical purposes. It must be remembered, however, that it is a long way from being infallible, and the matter is of considerable importance to those who buy and sell sheep, but more particularly studs. Court cases have often arisen over the point.

The celebrated English authority, W. C. Spooner, quoting Dr. Simonds, gives the following data as to the dentition of sheep. "At one year and two months, two permanent incisors; one year and nine months, four teeth; two years and six months, six teeth; three years and three months, eight teeth." A case is given by Mr. Jas. Sloane, of Mulwala, N.S.W., in which he had a stud ram that when purchased and shorn had only lambs' teeth. At next shearing it had six teeth up. The breeder of this sheep had forced its growth in the first year. Mr. Sloane says:—"This may not be unusual with well-fed sheep, and is very seldom looked into. I believe that my sheep usually have their six teeth in the twenty-eighth month, and am almost certain that the last two also come more quickly than in England. This refers to well-cared-for sheep. Those that are pinched and kept back by climatic vicissitudes are likely quite irregular." The times given by Dr. Simonds and Mr. Sloane probably refer to the dates on which the teeth first break the gum, and each pair would not be properly developed until three months later.

A New Zealand authority gives even earlier maturity. He says:—"The following table shows the alterations of a sheep's mouth during the process of dentition. It gives two averages—an early and a late—and indicates that stud sheep cut their two first permanent incisors at twelve months, and their two last at two years and six months, while flock sheep cut their two first at one year and three months, and their two last at two years and nine months. It is because of this, and the fact that sheep have six teeth at two years, or shortly after, that sales of sheep in England by their teeth are unknown. Sheep are sold as lambs, tegs or hoggets, shearlings, two-shear sheep, three-shear sheep, and aged—four years and upwards. This was the practice in my time, and I believe it obtains still."

TABLE OF THE DENTITION OF THE SHEEP.

	Early Average. Stud.	Late Average. Flock Sheep.
Two permanent incisors ..	12 months	1 year 3 months.
Four ,, ,, ..	1 year 6 months	1 ,, 9 ,,
Six ,, ,, ..	2 years	2 ,, 3 ,,
Eight ,, ,, ..	2 years 6 months	2 ,, 9 ,,

In this case the authority himself states that the times are those at which the teeth first show, and full development will not be attained till three months afterwards, but even so it will be seen that there is considerable variation in the sheep's dentition under different circumstances. However, as already stated, for most purposes the " one-year-old 2-tooth, two-year-old 4-tooth, three-year-old 6-tooth, four-year-old 8-tooth or full mouth, rule will do, though the reader will realise that it is not by any means a sure test of age.

After a sheep is full-mouthed (that is, has shed all its infantile teeth and replaced them by permanent ones), at from five to six years the teeth in front grow long and open out, leaving spaces between them, a process which varies according to the country grazed on. If it is gravelly the teeth wear down instead of becoming long. At the seventh year they usually get loose and drop out, and when this takes place the sheep are called " broken mouthed" or " failing." Beginners and small farmers should dispose of their sheep soon after they reach this stage.

The term " broken-mouthed" should, however, really include any of the following :—1st, any whose teeth are worn to a point ; 2nd, any whose teeth are divided, that is, which do not touch each other at the sides, from top to bottom, from crown to gum ; 3rd, any having teeth worn down close to the gum ; 4th, any whose teeth are not perpendicular, where the top part of the teeth leans forwards, so as to strike the pad of the upper jaw on the outer edge, or perhaps over it ; 5th, any whose teeth exhibit an unequal cutting surface, that is, which are worn down in one place more than in another ; in fact, any sheep whose mouth is so imperfect as to prevent it feeding with perfect ease and effect should be placed in the category of the broken-mouthed, whatever be its age. "Hooked" teeth may include any aged sheep which, gifted with an excellent constitution, hold to their teeth, which grow freely and fantastically as the result of feeding for a long time in succulent feed; "gummies," not necessarily very old sheep, but which either from climatic, constitutional, or local conditions, have cast their front teeth comparatively early.

The safest sheep for a small owner to buy are those rising four-tooth, or six, as he can then make comparatively sure of the age. With full-mouthed sheep it is possible for smart dealers to sell seven or eight-year-old sheep as six-year-olds by giving the mouths a little dentistry. There is no mistaking, however, the big permanent incisors when they come up from the gums, except in odd cases, when malformed teeth appear.

The condition of a sheep's teeth depends very largely upon the feed and constitution of the soil on which he is bred and fed. It is not uncommon, or rather was not uncommon, before the days of overstocking, to meet with sheep which, from their lambhood, had always had an abundance of soft, long grass, still at 10 to 12 years of age possessing the incisor teeth more perfect then those of other sheep at 4 years old which had been fed upon an overstocked run. Nothing short of a file or a grindstone will wear down a sheep's teeth like grazing on an overstocked run, especially if the soil be sandy.

On a run where the grass is three or four inches long a sheep, at one single cut of the incisors, will obtain a whole mouthful. This is immediately thrown back to the molars, and by them prepared for the first stomach. These molar teeth are protected by perfect masses of enamel, and are never known to fail, so that the importance of promptly relieving the incisors and throwing the attrition upon the molars is manifest. On an overstocked run the very reverse takes place. The sheep has to make ten or perhaps twenty bites before he can pass back to the molars as much food as in one bite on well-grassed country he transfers to them. In the former case the sheep secures at one bite some three inches of tender and succulent food; in the latter it obtains, at the expense of much greater time and exertion, and with gravely augmented wear and tear of the incisors, perhaps a similar quantity of dry, wiry, and almost innutritious fibre, for grass is, as all know, much drier, harder, and tougher at or near the "tussock" than in the extended blade. But this is not the worst of it; it is more fibrous and tenacious, so that often it is not severed by the bite, but twitched up by the roots, bringing with it into the animal's mouth more or less sharp, keen sand, and here we have the grindstone, owing to the ruminant nature of the creature, in full and constant operation. Of course, it must be understood that we are not referring to young springing feed, but to old grass that has been eaten down as a result of overstocking.

It is often said that short grass is the sweetest and best for sheep, but the assertion must be limited by a consideration of the relative length of grass. If the grass be so long that the animal grazes without taking up particles of earth or sand, it cannot be described as short grass. If, however, it is shorter than this, then all the mischievous effects upon the incisors above indicated will be experienced. The same trouble is created by parasitic infestation, such as fluke, &c., as the sheep, prompted by instinct, lick and gnaw the ground to obtain salt. Heath country, and country bearing many different kinds of shrubs, cause, owing to the fibrous nature of the edible bush, much and rapid destruction of the teeth. On the other hand, saltbush and cottonbush are of a softer texture, and do not point and divide the teeth so much as the tougher and more fibrous plants and shrubs which grow in heath country.

CHAPTER XVII.

MANAGEMENT OF A MERINO FLOCK (*continued*).

DROUGHT MANAGEMENT.

Notes on Drought Management—Home Pastures and Agistment—Concentrate on the Breeding Stock—Conservation of Fodder—Variety in Feeding—Feeding off Withered Crops—Critical Time with Breeding Ewes—Weaning the Lambs—Licks for Starving Stock—Hand Feeding with Wheat or Oats—Ration for Ewes—Constructing Feeding Troughs—Ensilage—Native Trees and Shrubs as Fodder—Saltbush—Poisonous Plants—Variegated Thistle—Blue Couch— Treatment of Country after a Drought—Length of Time Sheep can Live without Water.

We come now to the most unpleasant phase of sheep husbandry, viz., drought time management. No country in the world, devoted to sheep raising, suffers from such extreme and prolonged droughts as Australia, so what will be written in this chapter will be set down with a particular view to assisting the grower in that country during the anxious and trying period entailed by a drought. It should also prove of use to those in other countries subject to very dry times, but practically all the advice given is the fruit of Australian drought experience.

At the present day, with mutton and wool worth far more money than they were twenty or thirty years ago, the sheep owner in a drought can afford to spend a great deal more in efforts to keep his stock alive and carry them through the dry time. Once his natural feed gives out, he has two courses open to him, either to send his stock away to country where grass is available, or to keep them at home and maintain life in them by artificial feeding with ensilage, hay or some balanced ration. In times past, sheep were carried through long droughts on edible shrubs and fodder trees, and even now in many parts they still prove an invaluable stand-by, but to nothing like the same extent as in years gone by. Continuous cutting—also ring-barking by rabbits—has practically eliminated them over large areas of country. However, the use of fodder trees, shrubs and bushes will be dealt with more fully later on.

If it is practicable to keep them, there can be little doubt that stock will do better on their home pastures—or where those pastures ought to be—during a drought than if sent away to agistment or rented country. Really the most important point is the water question, and if a sufficiency can be supplied, sheep will subsist on a very poor diet, provided they are given a lick that will counteract the effects of, or fill the gaps left by, foods such as scrub, dry grass or hay. Again, if the sheep have to be sent away to relief country by rail, there is a big risk of considerable losses both on the forward and backward journeys. Then there is the rent of the leased land, which—especially in a universal drought—is tremendously high on account of the demand. To ewes forward in lamb, the train journey is likely to be disastrous, and finally there is the grave risk of the sheep returning to their home country inwardly and outwardly infested with parasites, which are neither good for the sheep nor the pastures. Of course, if they can be moved by road to country fairly convenient, and the route is in comparatively good order, it is a different story, and may prove a very paying proposition, but good roads and good drovers are usually a scarce commodity in a drought. Sending stock away also means a rest to the owner's sensitive nervous system from the sight of slowly starving stock perishing under his eyes all day, and the never-ending worry of looking after them, putting them on their feet, and finding food for them. However, when all is said and done, if water is available, and hand-feeding can be carried out, it will usually pay to keep the sheep at home. There are holdings in Australia that have never sent a hoof away in droughts that have occurred during the last 30 years. By good management, and supplying their stock with food in the form of licks, together with hay and grain, the owners have been able to pull the stock through with less loss than if the latter had been sent away. Of course, the loss has been above normal, as it always is in hand-feeding, but not very serious as drought losses go.

Water is the main essential. If that gives out or becomes putrid then anyone is "stumped," and moving stock becomes imperative, but while the water is plentiful and good, many holdings could keep their stock at home, and they will, as has been said, do far better. Ewes lamb better, and the lambs do better, but no ewe will rear a lamb on absolutely dry feed unless she is supplied with a food that contains ingredients in which the ordinary dry feed is lacking. This point will be discussed more fully later on.

It can be said that it is advisable to bestow all one's energies on breeding animals alone during a drought, and females can be fed fairly generously for thirty or forty weeks without spending more than their worth, provided they pull through. A good ewe in a couple of seasons should pay back in wool and progeny all the expense bestowed on her. With castrated male stock it is a different matter, and the vanishing point of profitable feeding is much more quickly reached.

To feed sheep at home, they should be split into as small lots as possible. It is rather difficult to know exactly when to start feeding; it should not be begun too early, nor should it be left till the last vestige of natural feed has disappeared. Again, it is not always practicable to feed in small lots, as it can only be done where water is convenient; to feed stock and to have to drive them a distance to water and back to the feeding ground is bad policy, because it means that more food and water is required to maintain the animal. If fed in large mobs, however, there is too much crowding and hustling when the ration is being served out, and numbers receive internal injuries. The greatest percentage of deaths from this cause occurs in ewes in lamb. The foetus gets displaced, and the animal, already weak, has not enough surplus strength to void it when the time for parturition comes. The smaller the mobs, and the less they are disturbed, the better they do.

Where it is possible, nothing will pay better than accumulating a store of hay or ensilage in good years against the drought that must inevitably come. On big properties, and in certain districts, at the present cost of labour, etc., and with tens of thousands of sheep to feed, it is more often than not impracticable to cut and stack a quantity of fodder that will be of any appreciable value in a long drought, but on the other hand, with a small or averaged sized flock, it should be quite possible, where there is good grass or herbage, to put by sufficient ensilage to relieve the owner's mind of a great load of anxiety when the drought does eventually occur. There is a great deal of controversy over this question of fodder conservation, and a large amount of cheap advice from self-styled authorities whose knowledge of country conditions and droughts does not extend beyond a curtailment of a water supply for their suburban gardens, but the principle of the thing is obvious enough, and no sheep owner, provided he can see his way clear on a profitable basis to build up a reserve of natural fodder in the form of ensilage or hay, should omit to do so. Good ensilage is not hard to make, and it will save many a thousand sheep when the pastures give out. The most important thing to remember regarding droughts is that another one is sure to come sooner or later, and if it finds the grazier prepared, he already has the battle half won.

Too close stocking in normal years intensifies the dry times. Some owners object to allowing any edible plant life to run to seed, on the score that if it is not eaten off, the hot winds of summer will blow it away. As a matter of fact, it is only the husk and straws that shift: the seeds of most of our herbs and grasses are provided with an anchor, and of themselves do not move far from the parent plants. Stock will thrive for a considerable period by snuffing up the seeds that collect. In burning off, except when done for cultivation, small sticks should be left, only such timber as affords shelter for rabbits being destroyed. The small sticks do good in that they break the wind and prevent the surface from becoming wind-swept. Moreover, they afford shelter for seeds, and enable grasses to reproduce. Green shelter belts should be left to provide warmth, which is quite as necessary as food, and enables stock to do well on half the sustenance that they require on bleak, unsheltered places. Droughts are always felt more by stock when the weather gets colder, and that is one reason why they should always be fed during the warm weather on the unsheltered parts, the paddocks affording the best shelter being spelled and used for the cold weather feeding.

Variety in feeding, when it can be done, gives better results than a uniform diet, especially in the case of ewes forward in lamb. In times of drought, when hand-feeding has to be resorted to, more deaths are caused by indigestion than starvation, food being supplied quite unsuited to the species of animal, while at other times insufficient variety is the trouble. The change from any one diet should be gradual. Thus, it is not altogether wise to feed on ensilage, and then suddenly change to green lucerne or barley or hay and molasses. Dry hay for ewes lambing or in lamb is bad if fed alone; it should have molasses with it to aid digestion. It can be varied to chaff mixed with molasses, or damped and mixed with bran, and this again varied by leaving out the bran and adding steeped wheat or corn or crushed oats. Of course, this kind of treatment cannot be so well carried out where sheep are in large lots, but it is quite suitable for small farm flocks, &c. Lucerne hay is one of the best drought foods, and it should always be damped the night before it is to be fed to stock. This makes it keep the leaf, and it is also much more easily digested. Straw, with or without molasses, is not good, as it is very liable to impact the stomach, no matter how much molasses is put with it. Straw being practically the refuse of the wheat, or the dead wheat plants, there is too much fibre in it. With dry feeding, molasses should be used in the proportion of 1 gallon to 10 gallons of water for ewes in lamb.

With regard to feeding off withered crops, do not leave them too long before turning the sheep in, otherwise they will have lost any nourishing qualities they may possess. To get at the time or stage when rain will not revive a crop into a paying proposition to harvest in the ordinary way, just pick out a yard square of the best of it, and give it through a water can about two gallons of water. This would be equal to roughly about two and a-half inches of rain. If it shoots into seed, or if already in seed it fills out the grain, there is still a chance for it. Otherwise feed it off.

The most critical time with ewes is about three weeks before lambing, when they often appear to become stupid and lose the use of their spinal columns The ailment is what veterinarians call "abomastites" or impaction, and is an inflammation of the true stomach due to sudden changes in the condition of the food, or in the food itself. It is caused not so much by an obstruction, but by the cessationof the peristaltic action of the intestines, the contents of the stomach being found more or less fluid after death. Consequently strong purgatives are detrimental until the inflammation is abated, as it is this that stops the peristaltic movement of the bowels. Until this is restored the ewe will remain stupid and convulsed; in fact she will have convulsive fits and froth at the mouth, showing that the stomachs are not in normal working order. In the case of a few valuable sheep being affected, one could administer enemas, and give oleaginous drenches and wait patiently for the subsidence of the inflammation, but unless it is possible to treat the stock through their food, this method, in dealing with any numbers, would be out of the question.

If possible, when signs of the trouble show up, drive the ewes quietly to a lucerne paddock or some other green feed, and allow them to graze for a few hours daily. If this cannot be done give a few feeds of lucerne hay, and, if the ewes will take it, a lick comprised of molasses 20 lbs., Epsom salts 10 lbs., and salt 10 lbs.

This important question of saving the breeding ewes and lambs in droughts suggests the urgent necessity of investigations with a view to finding some convenient form of fodder ration. It should be possible to manufacture such an article in the form of a cake, which would prove a veritable godsend provided it could be made at a reasonable cost.

The wholesale destruction of lambs when dropped, practised in many cases to save the ewes, is often over-impetuous. If the position is really bad, it is better, as a first recourse, to destroy only the male lambs, and then if it is unavoidable, later kill the ewe lambs. If the latter are kept, there is a chance of them getting not only their mother's milk, but also that of odd foster-mothers to help them along, as in times of drought, though a very large percentage of ewes have no milk, there are many that have a little, If, therefore, the male lamb is killed, not when dropped, but after it has been cleaned and suckled by its mother, as it is then that the milk begins to come in gradually increasing quantities, there would be a good supply.

When droughty conditions prevail, if lambs are to be retained, and not sold, it is better not to wean them at an early stage. They thrive better and there is less parasitism if left with their mothers until the first autumn rains, or if these rains do not eventuate, they can be left right up to shearing. It makes little or no difference to the following lambing, as they wean themselves, and the ewes' lactation period is not very much prolonged over the usual period. The lambs, after their mothers dry off, use her as a guide to and from water and feed. When lambs are weaned in a dry spring they get in little bunches by themselves, and, as the weather becomes hotter, some get too much water and others not enough. This state of things does not occur to anything like the same extent if they are left with their mothers until good rains fall, making green feed and putting water close to the feed all over the run. The ewes also lead the lambs at necessary intervals to the salt troughs, to which they should have access all through a dry time, especially if they have to drink continually at tanks or dams, as such places are the breeding grounds of parasites.

We come next to the question of licks. As already stated a good deal can be done to save stock with lucerne hay, chaff with molasses, maize and other kinds of fodder, but as a general rule this is only applicable to inside districts and close to railways, unless feed can be irrigated or otherwise grown locally on country further out. A concentrated food, if given to stock before they become too weak, together with some dry grass or scrub, will assist to keep them strong and healthy for a very considerable period, provided plenty of water is available, the idea being to give them a lick rich in albuminoids, carbohydrates, and phosphates—which the dry grass and leaves lack—with iron, which acts as a tonic and assists to digest the coarse, unnatural food. A mixture recommended by a grazier of long and sound practical experience, Mr. H. C. Carter, of Yarraman North, N.S.W., for lambing ewes when feeding upon scrub or very dry grass, is comprised as follows :—Coarse salt 200 lbs., linseed meal 100 lbs. (Meggitt's meal if ground linseed is not procurable), sulphate of iron 6 lbs., slacked lime 10 lbs., sterilised bone meal 20 lbs., gentian, coriander seed, or aniseed 5 lbs. The whole should be carefully and thoroughly mixed. The salt included in licks controls the quantity of other ingredients consumed, thus preventing a few animals getting nearly all the food. After licking for a time salt sets up a feeling of nausea, and the animals walk away. If it is desired to give more or less linseed it can be done by increasing or decreasing the quantity of salt in mixture. The lime can be increased or decreased, according to the nature of the country upon which the sheep are running. Water in some paddocks contains a good deal of lime, and in these it is not required in the lick. The simplest way to give lick is to place it in troughs near pads where stock go to and from water. A hollow log with one side out makes an excellent receptacle.

With regard to specific artificial feeds and rations for starving stock, wheat is especially sustaining, but a great deal depends on the way it is fed. A good method is to boil it in a mixture of molasses and water. Take about 16 gallons of water, boil, add 1 gallon of molasses, put in a bag of wheat, and allow to boil again. Cover the tank with bags, and in the morning the whole of the moisture should be found to have been absorbed by the wheat, which will then be ready for feeding. Bag troughing, made of wheat bags strung on two No. 10 galvanised wires, and supported by 2 x 1 hardwood posts every four bags, will be found very efficient. The wires should be placed about 1 ft. apart, leaving the trough about 6 inches deep. Wheaten chaff should be run into the troughs at the rate of about ½ lb. per sheep per day, and on this run the moistened wheat at about the same rate. This should be sufficient when there is absolutely no feed in the paddocks, but while there is a little seed and other picking, half the quantity may be supplied. For, say, 20,000 grown sheep, it would be necessary to instal about eight separate feeding stations, five lengths of troughing 80 yards long being erected at each.

Many men maintain that there is no necessity to soak the wheat at all, and state that sheep do better on the dry grain. Mr. S. Wilson, Lake Cowal, N.S.W., writing to "The Pastoral Review" during the 1919 drought, said :—

" We have used wheat for feeding our sheep in every drought since 1901, and have found it to be the most satisfactory artificial feed we have tried. In a recent very severe drought we were feeding 1200 weaners on belah, which is not the best scrub feed, and as they were dying fast we gave them about 90 lbs. of dry wheat per day in addition to the belah, with the result that by the end of the third day they stopped dying. This, I think, is conclusive evidence of the value of dry wheat. There is no necessity to soak it at all. Simply broadcast it on a red soil plain, or put it a bag at a time in a tray sulky, with a 1½-in. auger hole in the front portion of the floor for the wheat to pour through. Use a pony if possible in the sulky, so that the grain will have a tendency to slip forward towards the hole, or lower the shafts in the back band for the same purpose.

"If, however, anyone does prefer to soak the wheat, the best way to do so is to put it loose into tubs first thing in the morning, and bag it up after four o'clock in the afternoon. By so doing it will be found to be well swelled, and at the same time free from outside moisture next morning, and consequently will not get dust adhering to it when distributed to the sheep. We have fed over 500 bags of dry wheat to our sheep during the last six weeks, with most satisfactory results, and so far have not found the grain pass through them undigested, although we are well aware that this does happen in the case of cattle." Undoubtedly cases occur where sheep die from eating wheat, but it is probably because it has been badly or carelessly given. The wheat must be laid so that no sheep can get too large a helping, which is liable to kill them, while others get none, and this is where the greatest care is necessary in all grain feeding. As a matter of fact, there is a risk of this happening by distributing through a hole or funnel in the cart, unless the flow of grain is carefully watched and regulated, and for this reason we prefer the method of feeding with a light shovel direct from the bags right and left as the cart moves along, the aim being to distribute it over as wide an area as possible.

If there is absolutely no other food, a little hay, say ½ lb. per day, can also be distributed from the cart by hand, just a light trail, as it were, following the vehicle some little distance away from the wheat. Great care should be taken to feed the wheat on hard, firm ground, so that the sheep will not pick up the dirt, and if the ground is wet, grain should not be given, as it sticks to the earth. Do not let any strings fall with the hay, as these sometimes kill sheep.

Experience points to the fact that ½ lb. wheat is the maximum daily quantity that can be given with safety, and if the hay has much grain in it, less than the full ration of wheat should be given. Many believe that if taken in time, that is, before they get too low, sheep will pull through with very little dry feed on ¼ lb. of wheat per day, if it is given regularly. A good plan is to start by giving 1 oz., and increase the dose to 4 ozs. after they all come to feed together, so that there is little chance of a few getting five or six times the amount intended for them, which would, of course, kill them. A sure evidence sheep are getting too much grain is when they show signs of proppiness in the forelegs.

Oats is sometimes used instead of wheat, say ½ lb. per day, and if the same quantity of chaff is used with the oats, troughing made from wheat bags split open should be used. Another system of feeding for ewes is ¾ lb. bran and ¼ lb. chaff; this has often given excellent results.

The South Australian Government Veterinary Lecturer gives the following as a suitable dry ration for hand-feeding full and broken mouthed ewes in poor condition :—" Assuming such ewes to require a maintenance ration only, and their live weight to be in the neighbourhood of 100 lbs. (it does not matter if they are only half that, the weight of the sheep and feed being only relative), they will require 1¼ to 1½ lbs. of dry, digestive nutrient per day, or, roughly, 2½ lbs. or 2¾ lbs. of fodders available. Assuming such fodders to be barley, barley straw, and wheaten hay chaff, and possibly bran, we might try barley, ½ lb. to ¾ lb. ; bran, ¼ lb. to ½ lb. ; barley straw chaff, ¾ lb. ; wheat hay chaff, ¾ lb., which would give a daily ration of 2¼ lbs. to 2¾ lbs. per 100-lb. sheep. But we must remember that less food will be required if we can vary it, so, if feasible, oats might be given with advantage in place of some barley or straw ; or, if molasses could be obtained, they could be mixed into a dry ration with cocky chaff, and substituted for some wheat hay. Again, in the absence of green feed, ½ oz. to 1 oz. salt will assist digestion, or ¼ oz. to ½ oz. slaked lime, or smaller quantities of both."

Under most systems of feeding sheep the weak tail of the mob is unfortunately liable to get nothing, and the stronger animals more than their share. To obviate this the following method may be tried :—Into a box in a motor car is loaded a mixture of wheat soaked in molasses. A funnel is made through the bottom of the car, and driving at a speed that outdistances the hungry sheep, a trail of feed is laid for miles. The car is then turned and run back parallel to the first line, which enables the sheep too weak to struggle with the others—the tail of the flock—to get their share. By this method two men in one car have proved that it is possible to feed 7000 sheep a day, and the whole thing is over by 10 o'clock in the morning. The rest of the day is devoted to preparing the feed for the morrow. A loaded car could distribute enough feed for 2000 sheep in ten minutes.

Mr. David Kelly, of Wirrilla, Manoora, S.A., writing in the Adelaide " Observer," gives some useful advice on the construction of feeders for feeding sheep on chaffed hay. He says :—

" It takes approximately one foot of feeder per sheep, allowing the sheep to feed on both sides, *i.e.*, 600 sheep would require 600 ft. of feeder. To construct this of wood or iron would be very expensive and cumbersome, and would hold water, which would spoil the chaff. After a good many experiments and some failures, the following has been found a very handy and satisfactory feeder :—Cut bags—good manure bags will do—down each side seam. Sew a dozen end to end, making a carpet about 75 ft. long. Then stretch two light straight wires, long enough to allow about 8 ft. of wire at each end of the bagging, between two trees or fences. Keep the wires parallel, and about 3 ft. from the ground. Then stretch the bagging along between the two wires, fasten it with a few stitches here and there, and overcast it securely along both wires. A small cross stick to keep the wires up to a handy position for sewing as you work along is worth while. Choose a sheltered place near to water in a small paddock that needs manuring, and lay your carpet of bagging with the wires in the sides flat on the ground. Put good anchor pegs at the ends of each wire, 15 in. apart, and fasten as tight as you can pull by hand level with the ground. Pull a third wire tightly along the centre of bagging, and anchor between the other pegs. Put in a double row of 2 x 1 pegs in a straight line between the anchor pegs, 15 in. apart, 18 in. high, and about 10 ft. from peg to peg. Keep an even height on the tops of the pegs. Pull the side wires of the feeder up on to the double row of pegs. Staple them on, and you will have a tight feeder with a wire along the centre bottom. Next bore a small hole in each side peg near the ground, push a light wire staple down over the centre wire, and tie down slightly to the side peg. Sew a piece of bagging into the end of the feeder, and it is complete. Keep the wires well strained.

" Method of Feeding.—Put your feeders in a small paddock handy to the general feeding paddock. Keep the gate shut until the chaff is distributed. Sheep will come up for their feed best at sunrise in the mornings, and if they get about 1 lb. a head of good chaffed hay, and a little bran and pollard and linseed sprinkled on the top of the chaff, they will eat it clean up in about half an hour, and lie down and chew the cud until midday, when they should be let out again. Don't disturb the sheep while at the troughs, or they will stampede over them and do damage."

So far, it has been shown that good results can be obtained by feeding on grain (preferably wheat) alone, and also with wheat and hay, but it is becoming more and more generally recognised that the best of all feeds is ensilage, especially for lambing ewes, and where it can be made and pitted on the property, will prove by far the cheapest. Once it is in the pit, it is immune from fire, rain or pests ; no insurance is required, and there is no deterioration. Therefore the wise farmer who has the feed in a good season, or can grow a crop of wheat or oats from which to make it, will conserve, not necessarily in one year, at least 100 tons per 1000 sheep. This will allow him to feed at a most reasonable cost for 75 days, and he will probably see the wisdom of doubling the amount above mentioned. It simply amounts to an insurance premium, but it is important to recognise that if hand-feeding is to be successful, it must be started before the sheep lose condition. Those who allow their sheep to go till they are almost dead, before they begin to feed, will find that they will surely lose the cost of their feed and their sheep as well.

In connection with the above, it is interesting to note that a trial in feeding sheep on silage was recently carried out at the Coonamble Experiment Farm, N.S.W. A draft of 1230 crossbred four-tooth ewes and 100 crossbred wethers was fed on wheaten and barley pit silage from March 18 to July 16, or a period of 17 weeks. During the whole of this time the sheep were confined in a bare paddock of 20 acres, and received as near as possible a ration of 3 lbs. of silage each per day. They maintained condition on this, and when turned out on some good herbage grazing they "jumped ahead." The amount of silage fed during the period was 211 tons, which cost for the growing of the crop and the pitting 7s. per ton. This, without the cost of labour in feeding, represents a total of £74, which works out at three farthings per head per week.

Mr. Colwell states that essential points are to keep available to the sheep a plentiful supply of salt and also water, and to spread the feeding over as long a period of the day as possible, instead of carting the day's allowance out in a couple of hours, which would involve heavy wastage. At the Coonamble farm the practice was to feed slowly and regularly, selecting a fresh feeding ground each day, with the result that the wastage was practically nil. Ewes in lamb should not have a continual diet of ensilage. Dry lucerne hay should be alternated just to keep the milk flow normal until the lamb is dropped and suckled. If sheep are shut up for feeding in small enclosures, a feed of ensilage in the morning and a bite in the afternoon will be found advisable. On the other hand, if they can roam round a fairly big area, and pick up leaves and rubbish, the one feed is enough. The actual making of ensilage will be discussed fully in a later chapter.

As has been stated previously, native fodder trees in Australia are not nearly so plentiful as they were. Many of them will not stand continual pruning, and although one or two cuttings at long intervals may not hurt them, droughts unfortunately occur rather more frequently than will permit of the necessary long spells from cutting and lopping. About the only trees that will stand pruning, and respond rapidly, are the kurrajong and weeping myall; the others take a fairly long while to throw out young shoots sufficient to pay for lopping. The causes of the denudation of fodder trees are many. The myall is subject to invasion by caterpillars and a parasitic mistletoe, that eventually kill it. The kurrajong is also invaded by a caterpillar, but beyond stripping the tree of its leaves, it does no lasting damage. The rabbit, of course, helps to prevent all reafforestation, especially of kurrajongs, which it ring-barks at or near the surface of the ground, particularly young trees, which should consequently be guarded.

Trees and shrubs will not entirely prevent stock losses in drought times, except on far out country, where the supply and variety are unlimited. Stock must have variety in tree fodders as well as in herbage. They will live a long while on the kurrajong and also the bull-oak, but the latter is a very slow grower, and when very young, sheep will not let it get away from the ground, either in good or bad seasons. Stock fed on almost any edible tree or shrub become impacted with what are termed " scrub balls," even with the ordinary salt licks, unless they contain other counteracting ingredients than salt, sulphate of iron, and Epsom salts. Lime, bone meal, and linseed, &c., require to be added to aid in digesting the fibrous edible scrubs. Perhaps if stock confined their attention entirely to the leaves, there might not be so much trouble, but they invariably chew the young twigs, and it is the bark of these that contains the fibre. The bark of the kurrajong is very fibrous, and so is myall.

A fair-sized kurrajong should feed 200 sheep for about two days if they get other picking, or even up to three days if they do not camp where the tree is lopped. A wilga will do nearly the same if it is not of the scraggy variety. A myall, roughly speaking, will feed 200 head about a day and a-half, and a bull-oak (not belah) the same. Belah is a much larger tree, but it takes a lot to feed as there is a good deal of waste stuff, such as rough twigs and dead sticks.

With this method of feeding, the growth should only be thinned, provided, of course, there are sufficient trees available, so that they will revive quickly. Any tree killed takes many years to replace, *i.e.*, before its successor can be of any use for feeding purposes. Kurrajongs can be cut back hard, practically to the trunk, and will come again splendidly. Both fairly wet and moderately dry climatic conditions seem to favour its growth. There are innumerable other native fodder trees or shrubs, such as mulga, supplejack, blue bush, etc., but we repeat that in feeding, it is imperative to give variety and a lick of some description as an aid to digestion. The nutritive values of forest or scrub plants vary considerably, and it is only by mixing a variety of them that a balanced ration is likely to be maintained.

A word may be said here regarding saltbush, which is not only an invaluable stand-by in the case of other feed disappearing, but in some parts of Australia will actually fatten, if mixed with a little dry grass, and good water is available. It is also good as a fire break, and will stand a lot of drought. Chemical analyses of Australian saltbushes show that in comparison with other forage plants, they are richer than barley, maize, oats or sorghum fodder, weight for weight, and are nearly equal to lucerne and the best meadow hay. Probably the most vaulable of the numerous varieties are the "Old Man," and the creeping saltbush. They can be propagated from seed, which germinates readily under favourable conditions in about eight days after planting. The seeds should be covered lightly, no deeper than an inch below the surface, to obtain the best results. Other methods of propagation are by cutting and layers, but these cannot be recommended for "outback" country. The best time to sow the seed is during the autumn or in summer if favourable conditions can be relied on, but if cuttings are attempted, they should be set out in the autumn.

With regard to poisonous plants, it will probably be noticed that their effect on stock appears to be much more marked in times of famine than in normal seasons. This is not because the plants in themselves are more poisonous, but is due to the condition of the animals eating them, and to the fact that being ravenous, more of the so-called deadly weeds are eaten than in good seasons, when the animals are rarely hungry and have a greater variety of pasture to feed on.

Take the variegated thistle in Australia. In a drought, if sheep come across a patch in the early stages of its growth, it is liable to cause heavy and rapid mortality, especially if the stock are famishing, and they get a drink immediately before or after partaking of it. Blue couch can also be deadly in its young stages, but once it is in flower it is a good fattener, and quite harmless. Both these plants grow in close proximity to water, and with travelling stock an eye has to be kept lifting for them to avoid losses. The best thing to do is for the man in charge, who should be acquainted with the plant life, to go ahead to where he intends to camp or water. If he finds any thistle or blue couch, he should get a shovel to work and chip it off for about a chain wide, take the stock in small mobs to water, and when they have watered, take them on to a spot where there are none, or only a few, of the dangerous plants. After the chipped plants have wilted a little they become innocuous, and only odd animals may develop sickness, from which they often recover.

A good implement for scraping tracks to water where variegated thistles abound is an old cross-cut saw cut down to about two feet in length, with a hole cut in the middle for the handle, and two smaller holes, one at each side of the handle hole, for the purpose of fixing stays in order to keep the scraper firm on the handle. The business of scraping is an easy one, and takes but little time, because in droughts there are no large areas of growth. The plants occur mostly in narrow patches where there is some moisture. Of course, in good seasons when these plants cover acres, the scraping is not practicable, but then it is not so necessary, as travelling stock as a rule are not hungry when they go into camp, only an odd one eating enough to kill. Again, in good seasons the patches always contain some nice, sweet grasses and other harmless plants, which are preferred to the harsh-leaved couch or thistle. After heavy thunderstorms in summer on sandy patches is when the couch puts up a green shoot in a night, so if hungry stock get at it in the early morning, just after rising from camp, there is almost sure to be trouble. The young thistle is most deadly at the same time of day, especially if there has been any dew overnight.

After a drought, country should be kindly treated, that is, allowed to spell, or be lightly stocked for at least a year, to enable all the plants to seed and propagate. Grass and herbs grow very luxuriantly after a long dry spell, and there is a natural tendency to rush stock on to it above its normal carrying capacity, with the result that it is eaten right out, or nearly so, and consequently does not get a chance to seed. Fairly stocked pastures, when a drought breaks, become reclothed quicker than overstocked land, and they go off more slowly when droughts are approaching. Neither should stock returned to their original pasture be allowed to scatter at once all over it, but should undergo a mild form of quarantine in one paddock or so, in order to see if they have contracted any ailment of a sporadic or parasitic nature in their absence. If tick or lice infested they should be kept separate until they are strong enough to be shorn and dipped, and the quarantine paddocks spelled if possible for eight or nine weeks. If this should not be practicable, all the fence posts, stumps, logs, or trees against which they have been rubbing (and these are easily detected by the foot marks, and pieces of wool adhering to them) should be disinfected by setting a flame of fire round them, or spraying them well with strong dip. Fire, however, is the cheapest and surest, but where wood for the purpose is scarce, a flame lamp, such as is used for singeing horses, is a cheap and adaptable tool, or else a piece of tarred bag made into a torch. Any carcase should be burnt, as it lessens the risk of infesting clean country, and keeps the pastures healthy. The same applies to internal parasites. One or two of the most unthrifty animals should be killed and examined for both fluke and worms, as much country has become unsound simply through this necessary precaution not being observed. If sheep are found to be badly infested with fluke or worms they should not be allowed to mix with sound stock for at least a couple of months or more. They should be drenched for worms, and supplied with good tonic "licks."

One often hears the question debated as to how long sheep can live without water, and it will be of interest in concluding this chapter to set down one or two instances that can be vouched for as authentic. Mr. Alex. Wilson, an authority on pastoral matters in Australia, with experience extending over half a century, gives the following case :—" I once had between twenty and thirty wethers get into a waterless paddock in Riverina in December, and they were not noticed till the February following. It was a hot, dry season, and the sheep were fat when found, but their wool had a decided break. It was a large paddock with scrub as well as plain. On the Scottish moors, if sheep were seen to drink the shepherd would at once investigate what was the matter, as it was assumed the sheep must be diseased." Again, a South Australian states that during a period of six months, including winter, a number of his sheep were in paddocks where no surface water was available, and a case is also on record where several sheep were missed from a paddock and were found three or four months afterwards in a low condition, having lived there without being able to get to water. The above may be exceptional cases, but there can be no doubt that sheep can subsist for a long period without water, though it is generally conceded that the advent of the rabbit has made a great difference to that length of time, as there are not available the nutritious roots and herbage which previously supplied a certain amount of moisture.

CHAPTER XVIII.

THE BLOWFLY.

How to Tell a Blown Sheep—Varieties of Blowfly—The Sheep's Health and the Fly—Methods of Prevention—Dipping in Long Wool—The "Jet" System, commonly called " Spraying"—Description of Plant and General Hints as to how to perform the Operation—Plan of " Spraying" Yard—Cage for " Spraying"—Care Necessary in using Poisonous Dip—Crutching—The Chalcid Wasp—Arsenic for Poisoning—Must be Systematically Carried Out—Traps—Various Dressings—Dry Arsenical Powder Dip as a Preventive.

One of the greatest curses that the sheep-man in Australia has to cope with is the blowfly, whose depredations annually cause an enormous loss. The fly is a most ubiquitous pest, and although some areas may prove comparatively free from the trouble for a period, there is no guarantee that the exemption will continue indefinitely. Neither can it be stated with certainty that there is any sure remedy or absolute preventive, although, as we will endeavour to show in the following pages, certain methods of treatment, and the adoption of a few cardinal precautions, will go a long way towards ensuring a marked degree of immunity.

Before making any definite suggestions as to the most practical methods of dealing with the pest, we will observe and study it under natural conditions, and thus have some data to go upon. It is less than 20 years since the blowfly came to be recognised in Australia as a serious and increasing trouble to sheep breeders, and it has gone on becoming more widespread and growing in intensity, until, as already stated, there are few districts where sheep maggot flies are not at work.

Naturally the heavy, close-woolled sheep soil their fleece round the tail and crutch more than the old class of loose-woolled sheep, and it was among the stud flocks and lambing ewes that sheep maggot flies were first noticed. Now, however, they attack all classes of sheep, and instead of confining their activities to the hindquarters, they impartially deposit their eggs on any part of the sheep's body, from the head to the tail. They blow anything, from blankets to herbage, and it can readily be understood that the loss caused by the death of sheep, damage to the wool, and the time and money involved in treating blown animals and taking preventive measures, is enormous.

The experienced sheep-man can soon pick a blown sheep out of a mob, even at an early stage of infection, for she keeps stamping her feet and twitching her tail as she stands in the yard, and on closer examination the blown wool is seen to be slightly darker and puffed up. When the infested sheep is caught, the wool will be found warm to the touch, and opened out, full of evil-smelling moisture, caused by the presence of the swarms of tiny maggots feeding and tearing the fibre of the wool with their curved jaws. If the sheep is overlooked, the ever-increasing maggots work down on to the skin, which becomes raw and inflamed, and as the wool sloughs off, becomes ulcerated, while fresh infestation may take place, until the wretched animal crawls away from the flock and dies.

For a long time there was a great diversity of opinion as to the particular kind of fly that was responsible for the maggots in the wool, for at least half a dozen different kinds can be distinguished in the paddocks around dead beasts and flying round the sheep yards. A series of experiments, however, was carried out by Mr. W. W. Froggatt, F.L.S., at the laboratory of the Entomological Branch of the New South Wales Department of Agriculture, and the identity of the flies responsible for the mischief was proved. Four species as follows are now known to be the parents of sheep maggots :—

Lucilia Sericata, the common metallic bright green fly of the streets, back yards and gardens of towns. It feeds upon all kinds of decaying animal and vegetable matter, offal, refuse, etc., and is the common sheep maggot fly of Great Britain. It is, however, not common in live wool in Australia.

Calliphora Oceaniae, the common blue and yellow-bodied blowfly that often comes into the house to blow meat. It is easily recognised by its bright metallic blue abdomen, being deeply blotched on either side with dull yellow, so that the middle and basal portion of the body is only blue. These flies lay their eggs or maggots on meat, other food and offal, and in the early part of the winter are very abundant in the bush, where they lay their eggs all through the winter on the soiled wool upon the sheep.

Calliphora Rufifacies.—This is the metallic green and blue blowfly that is so common all over the inland country of Australia. It is found flying about all kinds of dead animals and carrion, and under natural conditions deposits its eggs on dead animals and damp smelling wool on live sheep. The maggots hatching from these eggs are known as "Hairy Maggots." This fly is the commonest species all through the year.

Calliphora Villosa.—This is the larger and more robust house-fly, laying eggs in the winter, but living larvae in the summer months. In the winter and early summer months these flies attack sheep and lay their eggs upon the soiled wool; the maggots feed upon the substances in the wool, and, when full grown, fall out of the fleece on to the ground, where they pupate beneath the surface.

It is generally considered that the marked increase in the fly pest in recent years is caused, in a measure, by the absolutely necessary wholesale destruction of the rabbit pest, and in so far as the decaying bodies of the millions of rabbits destroyed provide suitable breeding grounds for the flies, this may be conceded, and it is also probable that in recent years owing to careless destruction of insectivorous birds, the fly has enjoyed a marked degree of immunity from his natural enemies. Further, the increased susceptibility of sheep to attack by the maggot fly may be put down as largely due to their wonderful development as wool growers, the production of wool per sheep having almost doubled during the past 30 years, and while breeders have made every effort towards increasing the production of wool, there is little doubt that many have not paid the same attention to the development of frame and constitution. At any rate, the extra weight of wool, in itself, in the words of the travelling investigator for the New South Wales Blowfly Investigation Committee, "is a very severe handicap to any sheep, and the result has been loss of vigour, activity and robustness of constitution, thus rendering the sheep more liable to attack by any disease or parasite. I believe that ill-health is responsible for most of the trouble, over-development of tail and crutch wrinkles and mutilations by the shearing machines causing practically all other cases. I am certain that closer attention to the health of our sheep and the exercise of more care in shearing, backed up by more careful selection of stud sheep, with a view to improve their constitution and avoidance of sheep with highly-developed tail, crutch, and thigh wrinkles, would very quickly result in a marked diminution of losses through the ravages of the pest, and also result in increased productiveness."

Of course, many experienced men do not agree that ill-health is the predisposing factor in favour of the blowfly, but it is a theory that is worthy of close investigation. It is a strange thing that though in a small paddock there may be enough flies to blow every sheep in the Commonwealth, yet only a small percentage will be struck. Why are the others immune? It can hardly be a matter of chance, the minority must be more attractive for some reason, and it seems quite possible that the reason is an offensive smell—to the fly delectable—arising from a diseased state of some of the vital organs, eliminating, of course, open cuts and sores. Even very slightly disordered kidneys give rise to offensive urine, and the sheep is liable to be struck upon the crutch, while affected livers, resulting from gross condition, might cause the animal to be blown on the back. Other sheep are attacked when in poor condition, which may be due to the presence of internal parasites impoverishing the blood and creating a high temperature. In any case it can be seen that the theory is a reasonable one, deserving of careful consideration by investigators, for if it hits the nail on the head, the campaign against the pest must be conducted on different lines to those followed at present.

To-day there are five main ways of dealing with the fly, viz., dipping or squirting the dip into the wool by a pump through a jet nozzle under pressure, crutching, poisoning, trapping, and liberating the chalcid wasp, a natural enemy only discovered comparatively recently. It has been proved fairly conclusively that attacks on sheep that have been dipped are not nearly so serious as those on untreated sheep, provided a reliable dip is used and the operation carried out with due care. The arsenical powder dips are the ones that afford protection. Liquid non-poisonous dips, of a carbolic nature, are ineffective. They may kill maggots and be useful for dressing maggot wounds, but they will not stop the blowfly pest. Having selected the right dip, it must be used properly. Many sheep owners cordially detest the operation of dipping. They begrudge the time and labour it involves, and rush it through in such a manner that the ordinary benefits from dipping are completely lost, to say nothing of blowfly prevention. The subject has already been fully dealt with and need not be discussed again, but it may be pointed out that it is far better to devote a little extra time and trouble to careful dipping than to be continually mustering the sheep for crutching or dressing as the result of fly activities. The fly may strike well-dipped sheep, but as a general rule, if the careers of the maggots deposited are followed, it will be seen that they shrivel up and die before they do much harm, if any.

Experience points to the advisability of dipping with at least four to six weeks' wool on, and it is logical to assume that if this ensures a measure of protection, that protection must be increased if the sheep carry more wool at the time of dipping. This opens up a question, however, which requires considerably more investigation than it has received up to the present, for there is a belief among some sheep owners in Australia that dipping in long wool is a dangerous practice, liable to injure the fleece, or even to cause a break in the staple. Many have dipped most successfully with the sheep carrying three or four months' wool, and others claim that the value of the fleece has been seriously depreciated. Of course, a sheep dip is but a tool in the hands of a user, and the explanation of the conflicting evidence may lie in the way the operation was carried out The chief points are that the sheep should be in a thriving condition, they should be allowed to cool off before going into the bath, and the mixing, stirring, immersion and drying must be well and faithfully carried out according to the previous directions in the chapter on dipping.

While on the subject, it is interesting to quote the practical opinion of a big South Australian owner, who dips in long wool. He says :—"I tested it five years ago, and have never departed from the practice. The wool is discoloured for a month or two, but before the winter is over all trace of discolour is gone. I have not had a sheep struck with flies here during the last five years. As the country abounds in herbage, sheep get very daggy. About the end of March or beginning of April all sheep are put through the shed and carefully crutched with machines. The wool saved pays for the operation, and the sheep are kept clean, and lambs thrive much better. We shear September-October, and dip in February, allowing sheep to thoroughly dry under cover." Where flies are very bad, if it is decided to adopt dipping measures, crutching should follow as soon after dipping as necessary, then swab the crutch and tail in the same arsenical dip as originally used, but at double strength. Remove every trace of attractive matter from the sheep, at least from ewes and weaners, and on no account wait for the flies to start in earnest. Where flies are not bad and sheep do not carry matter attractive to them, dipping, thoroughly carried out, is a great help, but where the reverse is the case, dipping and crutching should be combined.

Regarding the method of dealing with the pest by applying a solid jet of arsenical dip under pressure, it may be stated that as a preventive measure this is the best of all. General experience indicates Cooper's powder dip as the best to use ; in fact, to the best of our knowledge, no other makers have ever claimed that their preparations are efficacious for spraying. In any case, the following advice must be taken as based on the use of Cooper's ; all arsenical powder sheep dips cannot be used in the same way with equal safety and efficiency when used at a strength many times greater than that advocated by their respective manufacturers.

A few hints may now be given regarding the actual application of the method. In the first place, the word spraying is a misnomer, but as it has become customary, we will continue to use it. The dip is not applied as a spray, but by means of a *solid jet*. This is forced through an $\frac{1}{8}$-in. nozzle, under about 40 lbs. or 60 lbs. pressure, the nozzle being held close against the sheep. For treating sheep up to the number of 2500 per day, hand-operated plants give satisfaction, but with a power plant it is possible to treat 5000 sheep per day.

Spraying plants vary in detail, and need not be described here, but given a suitable outfit, it is desirable to do as much of the spraying as possible at the woolshed, which has conveniences such as rain water tanks, grating floor, and above all, shade and shelter. On large stations portable plants are useful for treating sheep on outlying portions of the run The woolshed is, however, a suitable place to operate a plant, because it provides accommodation for cooling the sheep before spraying, splendid facilities for the operation, and shelter for drying the sheep after they have been treated.

The majority of sheds have a spacious sweating pen. It is generally divided by a partition down the centre, the entrance ramp serving both sides. It is a comparatively simple matter to construct a temporary race by utilising the permanent partition as one side, and using low hurdles to form the other. The race can be from 20 ft. to 60 ft. in length, 60 ft. for preference, if two leads of hose are to be worked. The width of the race should be 2 ft. 6 in., and the height on the side near the operator 2 ft. 9 in., while the other side can be 3 ft. high. The side near the operator should be made of sheets of corrugated iron if possible, to protect the legs of the operator from the dip fluid. The floor of the race will, of course, be the battens of the sweating pen. This temporary race can be removed in a couple of hours when the shed is required for shearing.

The sheep are brought into the side of sweating pen away from the spraying plant, and are worked into the race as required The race should be only three parts full, so that the sheep can stand loose. The operator stands outside the race. It is not necessary to have an assistant in the race, as it is not a difficult matter for the operator to spray every sheep just where necessary.

In addition to the vat which contains the dip mixed at the required strength, there should be, close handy, an open tank of convenient size to hold clean water for mixing purposes. This tank should be connected with the rain water tank outside the shed. Only rain water or good soft water should be used. Hard water seriously depreciates the results of spraying, and if nothing but hard water is available, washing soda, to the extent of 2 lbs. to every 100 gallons of water, should be added.

For mixing the dip, a number of empty oil drums with wire handles are required. First bump the packets on the floor to loosen the contents, then cut them open and pour the powder into an empty petrol or kerosene tin. Then get a pannikin of pint size, take four pannikins full of dry powder from the petrol tin, and put it into the oil drums, four pannikins to each drum. Then pour on a little water, and carefully mix into a paste, stir thoroughly, and add water little by little till the drum is filled, stirring all the time. It is advisable to do this mixing the day before the dip is required. During spraying, if replenishment is likely, see that the dip is soaked as long as possible before being used.

If each drum is mixed in this way, it will contain four pannikins (four pints) of dip to 5 gallons of water. When it becomes necessary to replenish the vat, all that is required is to empty a drum of the dip into the vat, and refill the drum from the clean water tank, and pour it also into the vat. This gives the required strength, *i.e.*, 4 pints of powder dip to 10 gallons of water.

When the vat is charged, and the engine started, the nozzles should be opened to let out what water there is in pump, pipes, and hoses. Once the yellow liquid appears the nozzles should be shut off until the release valve opens on the pump. This indicates that the required pressure is obtained, and spraying can be commenced.

When spraying, the operator should stand outside the race, and should take every care to keep the dip off his person. If men allow their clothing to get wet with dip, they are liable to be affected by the arsenic, especially in hot weather, when the pores are open. Buckets of clean water should be kept handy, so that the hands and arms can be washed every few minutes. If the dip comes in contact with hands and arms rub on boracic acid after washing.

Before putting the sheep into the race, all badly blown sheep should be picked out and penned for special treatment. Unblown sheep and sheep only slightly affected should then be put into the race. *Do not crutch before spraying.* Spray all ewes, lambs, weaners or rams in the crutch, over the tail, inside the hind legs, and on the heads and necks if necessary. *Keep the nozzle close to the sheep*, so as to ensure penetration. If the operator is inattentive he allows the jet to run on the gratings instead of carefully concentrating it on the sheep, and causes unnecessary waste. By exercising ordinary care it is not necessary to shut off the jet after spraying each individual sheep. The knack of transferring the jet from sheep to sheep without waste is easily acquired. See that each sheep is done thoroughly. Too heavy a spraying cannot do any harm, and it is better to overspray than to miss parts of the sheep that should be properly treated. It is stated that sheep can be safely and effectively treated in this way with any length of wool, from two weeks off shears to eighteen months' growth, or a week before shearing if necessary, or right up to lambing.

After the unblown and slightly blown sheep have been treated, the badly blown sheep should be put in the race. On these a weaker solution of dip should be used, viz., 2 pints of powder to 10 gallons of water. Spray the affected parts, and immediately after spraying sprinkle the scalded parts, where the maggots have been, liberally with boracic acid powder. The boracic acid has a soothing effect on the wound, which is cleansed, and quickly heals. About a week later these sheep should be again sprayed with a stronger solution, viz., 4 pints of powder to 10 gallons of water. Treated this way, sheep are generally safe from further trouble. The wound heals, and a new growth of wool soon covers the part affected. Occasionally odd sheep die after such treatment, but such sheep would probably have died in any case, and the number saved and protected far more than compensates for the few lost. When spraying badly blown sheep it is advisable to use less pressure, say, about 20 lbs., to prevent irritation.

For protecting marked lambs, after sprinkling boracic powder on the tail and into the purse, run the lambs into the race, and let them stand loosely. Spray them over the head, necks, backs, and crutch with half-strength solution—2 pints powder to 10 gallons water. Do not deliberately spray the cut surfaces. As the lambs stand with the tail and purse hanging down there is not much danger of the cut surfaces coming in contact with the dip.

Whenever possible sprayed sheep should be allowed to dry in the shade. Not only is it easier on the sheep, and a preventive of ill-effects, but if the dip is allowed to dry slowly it has time to penetrate and saturate more thoroughly.

When rams are blown in the ears use the solution at the 2 pints to 10 gallons strength. Direct the jet into the ear ; this will drive out the maggots. Then fill the ear, with the aid of a spoon, with boracic acid powder. Do not handle the ears or poke at the maggots.

It should be borne in mind that it is much safer to spray sheep in the winter than in the summer. In normal seasons the fly does not give much trouble in the hot weather. Sheep should be allowed to cool down before spraying, and they should not be driven far until they have become quite dry.

When spraying is done by means of portable or hand plants on outlying portions of the run, shade should be provided over the spraying race, and if more than 500 sheep are to be sprayed in a day the race should be provided with a grating floor.

Those engaged in spraying should be made aware of the poisonous nature of the dip solution, but if due care is taken no harm results. Frequent rinsing in clean water and liberal use of boracic acid will prevent ill-effects.

When spraying is finished see that clean water is pumped through the pipes and hoses to wash out the strong solution of dip. Otherwise valves and nozzles will corrode, and quickly become useless. All nozzles, taps, etc., should be kept well oiled if trouble is to be avoided. After spraying leave the pump full of water.

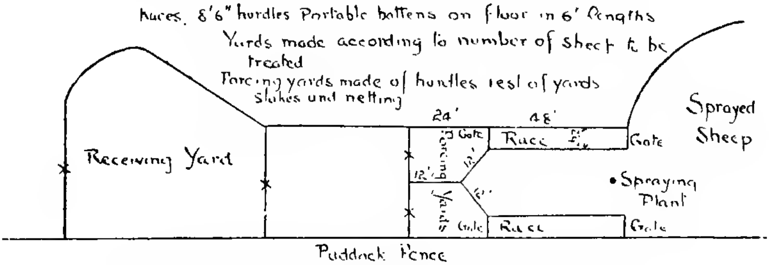
If the dip is not properly mixed, or if unsuitable water is used, a floating scum is liable to form on top of the liquid in the vat. This is dangerous, not only to the sheep, but to the man spraying should it come in contact with his skin.

The following figures give a fair estimate of the quantity of dip required :—

For spraying sheep on crutch, six months' wool :—
Approximately two-thirds case to 1000 sheep.
Approximately four cases to 6000 sheep.
Approximately forty cases to 60,000 sheep.

For spraying sheep on crutch, heads and shoulders, six to nine months' wool :—
Approximately five-sixths case to 1000 sheep.
Approximately five cases to 6000 sheep.
Approximately fifty cases to 60,000 sheep.

The plan of a spraying yard here illustrated is found to work well. It will be noted that two races are provided, so that two lots of sheep can be sprayed simultaneously.

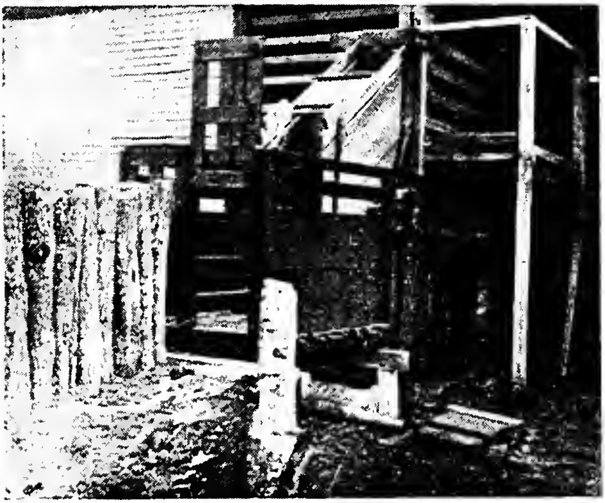

Races. 8'6" hurdles Portable battens on floor in 6' lengths
Yards made according to number of sheep to be treated
Forcing yards made of hurdles rest of yards stakes and netting
24'
48'
Receiving Yard
Gate
Race
Gate
Sprayed Sheep
Forcing Yards
12'
• Spraying Plant
Gate
Race
Gate
Paddock Fence

Plan of Yard for Spraying Sheep against Blowfly.

To save fencing, and so reduce cost, these temporary yards are erected alongside a paddock fence, and moved about the run as required.

The races are made from 8½-ft. hurdles, with portable battens for flooring in 6-ft. lengths. The forcing yards are also made of hurdles, and the rest of the yards are of wire netting, supported by stakes. Where yards are likely to be frequently used, it would pay to make the races and forcing yards permanent. The side of race next the person spraying should not be more than 3 ft. in height, and, as already stated, should be lined with flat or corrugated iron to save the clothes of the operator who works from outside the race

The following photos show a "cage" designed by Mr. D. W. Gaukrodger, Alice Downs, Blackall, Queensland, for efficiently handling sheep whilst being sprayed. Essentially the contrivance is a double compartment cage or box, with grated floor and drainage receptacle attached.

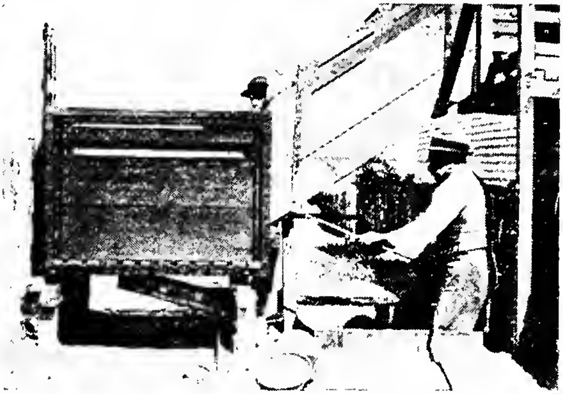


FRONT VIEW—NEAR DOOR LIFTED.

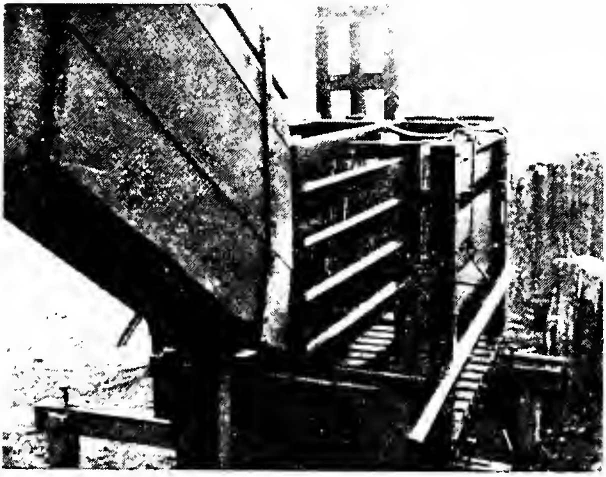
These compartments will each hold a sheep, and are sufficiently narrow to prevent the animal from turning round. Each compartment has in front a "lift up" door, which is actuated by a light rope running back to the man operating the cage.

The cage is mounted on grooved rollers which guide the travel along strong cross pieces of timber, and the man operating the cage can easily push or pull it along so that each compartment in turn is opposite the "shoot." This shoot is very similar to those used for bath dipping, but requires a hinged batten door at the top to prevent the sheep following down faster than required by the "jet man."

In operation a sheep is put into the "shoot," which becomes so slippery that the sheep slides gently into one compartment of the cage. The man operating the cage pushes or pulls it along the "travellers" until the tail of the sheep is exposed to the jet man, and whilst he is operating on this sheep, another one is sent down the "shoot" into the other compartment. The first sheep now being completed the door in front is lifted and the sheep runs out. This compartment being then empty is travelled back opposite the "shoot" to receive another sheep, which movement exposes the sheep in the other compartment ready to receive the spray, and



Side View, Showing Position of Jet Man and Cage Operator.



Back View, Showing Lever to Operate Cage, and Cords to Lift Doors.

being treated the door is lifted and the sheep joins the first one out in the yard, and so the operation continues, except an animal be required for subsequent examination, when it is released into a small middle yard.

View of Cage in Operation—Sheep just Released.

The "man power" required is one man operating the jet, another working the cage, and, of course, the usual yardmen to keep the sheep up. This number can put through 3000 head a day.

In adopting the practice of spraying, the fact must not be overlooked that powder dip at double strength is a powerful poison, and that sheep treated should be allowed to nearly dry before being turned out to grass. If this precaution is overlooked, sheep dripping poison will pass over the grass, and others eating it afterwards are very apt to be poisoned. It is most important, too, that sheep should not be heated either before or after spraying, otherwise heavy losses may occur. Care should also be exercised not to spray weaners—or indeed any sheep—that are suffering severely from grass seed. Badly-seeded weaners are not fit to stand any severe shocks, and the arsenic is likely to enter the system through sores caused by seed.

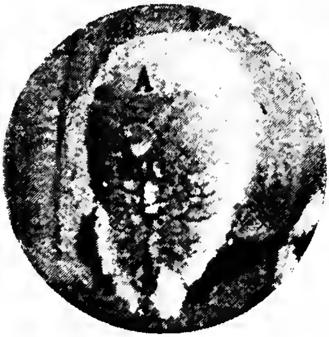
Spraying is not a positive cure or preventive against the blowfly, but it has proved itself to be an effective and economical way of dealing with the pest. It affords a very great measure of protection, but as it is not possible to spray every sheep alike when putting through large numbers, and as length of wool and weather conditions control the lasting effects of the dip, some blown sheep must be expected in bad seasons.

Odd sheep are no doubt killed by the treatment, but when such losses are put alongside the huge inevitable losses that occur from blowfly in spite of all other remedies, the economy and efficiency of spraying with a reliable arsenical powder dip is at once apparent. Thoroughness, however, is the essence of the contract.

A marked consequence of spraying is the absence of daggy sheep. Well-sprayed sheep apparently do not become daggy, and daggy sheep after being sprayed become clean. Why this is so is not easy to explain, but it is a fact that has often been noted. Spraying with the solid jet should render crutching unnecessary. Besides protecting the sheep, thousands of flies are killed by spraying. All flies that settle on the wet sheep die, and after the work has been in operation some time, flies disappear from the vicinity of the yards.

For ewe weaners from two to nine months old, this system shows to great advantage, and is much better than crutching. If odd weaners are blown, pick them out, and spray them again properly, and they should then be quite safe.

The fly has become so bad in Australia of recent years that crutching seems to have lost most of the deterrent effect it undoubtedly used to have. Opinions are commonly heard now-a-days, that where flies are very numerous, crutched sheep will become blown almost immediately, although on the other hand many men maintain that their flocks are far less troubled than if left uncrutched. Personally, we believe that the spraying system is the best preventive, it is far quicker, far cheaper, and there is not as much risk of careless men knocking the sheep about, to say nothing of cutting teats off valuable ewes. However, for the benefit of those who prefer to crutch, a few hints may be given. There is



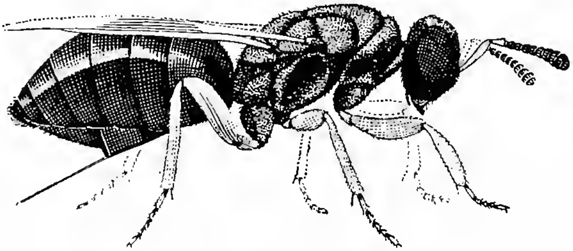
A—Properly Crutched.

B—Bad Crutching.

a right and a wrong way to perform this simple operation, as the two diagrams on p. 292 will show. Crutching as shown in " B " is so much time wasted. The wool should be taken as close as possible from a little below the hock right round the top of the tail to where it joins on to the backbone, and bevelled outwards (this prevents the wool which is divested of support from falling over and coming in contact with the urine and excrement). If this is not done the wool, by reason of the pressure behind it and the support being taken away (especially over the tail), has a tendency to drop down; all "fribs" should be cut off, as the least bit dirtied attracts the fly; unless the crutch shape is extended below the hock, as shown in diagram " A," the urine, etc., drops on to it.

The crutching boss should see that the men do not lean on the sheep with their knees or press heavily with their fists on the flank, as it is likely to disarrange the foetus in the womb. In crutching there is no necessity for either. The sheep properly held, and the open hand placed on the back of the leg is all that is required—they are so little time down that very few kick. It is a good plan always to crutch stud ewes. This clears the udder and gives the young lambs a better chance to get at the teat, although it does not necessarily prevent the fly striking the ewe.

The chalcid wasp, one of the five fly-fighting agents mentioned, is a fairly new development, and although the New South Wales and Queensland Government Entomologists have despatched consignments of these fly parasites to sheep owners in different parts of Australia—and are continuing to do so whenever requested—it is as yet too early to obtain an accurate estimate of the effect, if any, they are having on the blowfly. The scientists are very sanguine, however, and it may be that they will prove a very powerful enemy against the pest. The chalcid wasp, of which an illustration is given, is just 1-12th of an inch in length, of a



THE CHALCID PARASITE.

dull metallic green colour, and in general appearance looks like a tiny winged ant. It lays its eggs within the fly pupae by inserting its ovipositor through the pupal covering. The young larvae hatch out in about three days' time, when they bite through the fly integument, insert the head, and while their bodies remain outside, feed upon the juices of the fly pupae. As the larvae develop the unfortunate pupae are gradually eaten, until the full-grown parasitic larvae occupy the space once filled by the fly pupae, nothing of the latter finally remaining except the shrivelled integuments. The period of development of the larvae occupies about seven days from the time of hatching, the full-grown larva being a cylindrical, dirty-white, legless grub. The pupal stage occupies about five days, and the adults usually gnaw one hole in the puparium and escape, although two may sometimes be made. The time occupied from oviposition to the emergence of the adult is fifteen days, but there are indications that this varies with temperature. The males characteristically appear a little before the females, and are active little creatures, continually running over and over the empty pupal cases. As soon as the females emerge copulation begins, the females being ready at once to receive the males.

The number of parasites in each pupa varies considerably, but in most cases, the number developing in a single pupa has been found to be between twenty-five and thirty-six parasites. As the conditions under artificial breeding in the laboratory are much more favourable to the reproduction of parasites it is probable that the pupae are much more heavily parasitised than those under natural conditions in the paddocks. Considerable success in tackling the fly problem is hoped for as a result of this chalcid discovery, but only time can show whether those hopes are justified.

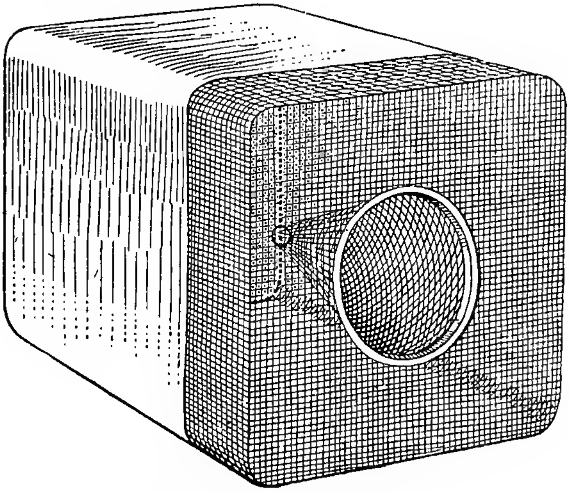
So far, with the exception of the chalcid, all the measures discussed have been preventive. The parasite is as yet, comparatively speaking, in its infancy, and as destructive agents the most efficient are poisoned baits and traps. In poisoning, arsenic is the best ingredient, and the following system should prove successful. Dissolve 1 lb. of arsenic and ½ lb. of washing soda in three gallons of water by boiling for 15 minutes, and when the water is off the boil add 2 lbs. of sugar. To this solution add water in the proportion of one of solution to three gallons of water, resulting in a mixture equalling 1 lb. of arsenic and 2 lbs. sugar to 12 gallons of water. Paint this solution on skins and carcases with an ordinary whitewash brush. Prepare the skins for bait as follows :—Taken from a sheep in the evening, wrap up each skin when warm with a pluck (liver, heart, lights, etc.) inside. Next day the skin and pluck, in the ordinary summer heat, will by 10 or 12 o'clock have become sufficiently putrid to attract flies. The skin is then opened out and the pluck left in the centre. The whole is then thoroughly painted with the arsenic solution, and the centre of the skin depressed, so that the pluck is left in a small pool of arsenic solution. Put each skin in the shade and on the ground, and where no natural shade is available, place a few boughs over it. The angle of a fence makes a convenient place. Putting the skin on the ground is a distinct advantage in windy weather, as flies dislike wind.

Lay the skins at watering places, favourite camps and at yards where sheep are being dressed. Paint them twice a day, and with the pluck they will continue to attract flies for two or three days. The skins in that time do not depreciate in value to any extent, and may then be put away for sale in the ordinary way. Also poison sheep that die in the paddock. If they are too putrid to skin treat in the following way :—Lay both legs on the upper side of the dead animal back across the body by slashing them under the arm or across the groin. Thoroughly saturate the exposed flesh and adjacent wool with the arsenic solution, and plentifully sprinkle it around the mouth, eyes, etc., in fact any spot where the flies are working and especially where the ground or grass is stained by the decomposing fat from the carcase. Two or three pints of solution will poison one carcase. Next day the carcase can be opened and repoisoned, and if treated each day will catch flies for some time—probably a week. The arsenic will destroy any maggots that are deposited, and if the carcase is repainted each day until it is burned or buried, it does not become a breeding ground. The baits can also be hung up or placed on the ground in half kerosene tins or oil drums containing some of the solution, or an arsenical dip thoroughly mixed and stirred, or else hung in sugar bags, soaked in the arsenic water, at the various places where the sheep congregate. As the offal putrefies it tends to liquefy, and so keeps the bag moist. In tins, some of the meat must be above water level. Where possible, it is advisable to enclose the baits with fine mesh wire netting, in order to keep birds out.

Remember that when a female fly is dead it still remains a grave source of danger. The body may contain from forty to sixty embryo flies in the form of maggots. These will hatch in the body of their parent. Therefore it is necessary to burn all flies, even when dead, which may be lying under the baits.

It is quite safe to say that about yards, sheds and in comparatively small stud paddocks flies can be almost wiped out by systematic poisoning, and even in larger areas the treating of carcases as described in the foregoing must be a very great help, as it not only kills the fly, but also deprives it of one of its greatest breeding grounds. Kerosene will be found useful for destroying the pest, and even cod liver oil is recommended by the Government veterinary surgeon in Noumea, who reports that in a series of experiments he discovered that it "has a specific toxic effect on all flies, mosquitoes, and ticks. If those parts of a horse most subject to the attacks of the fly are lubricated with this oil, the effect is to instantaneously kill even those flies which have only been lightly touched by it. It is possible to relieve a horse in a few minutes of all flies, simply by the hand smeared with this oil, and there is no danger of any subsequent caustic action on the skin. The same toxic action takes place in the case of house flies and mosquitoes, and even ticks, which are so hard to extract from the skin of a dog."

With regard to traps there are innumerable inventions, but it will be sufficient to mention here one or two of proved efficiency, that can be made by any handy man. Remove the end from a kerosene tin and cover the open space with galvanised wire gauze overlapping the sides of the tin about two inches, and bent around it.

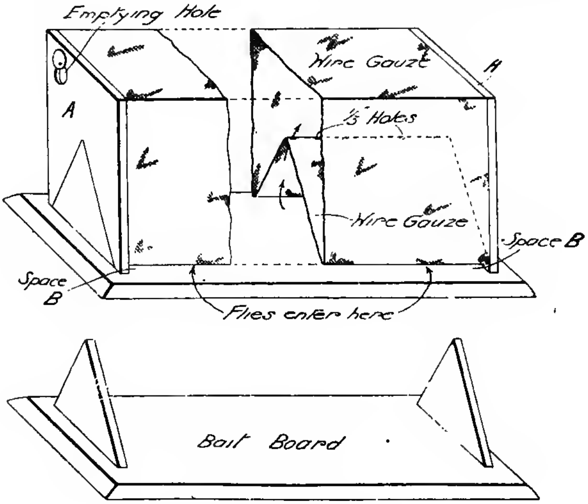


A SIMPLE TYPE OF FLY TRAP.

Let into the wire gauze covering is a funnel four inches across at the top and five inches in length, the opening at the apex (*i.e.*, into the tin) being about the size of a threepenny piece. The inside of the tin is painted white with cold water paint; if the outside is also painted the life of the trap will be prolonged considerably.

For a bait any offal (although the heart, liver, and lungs are the best), putrid meat, dead rabbits where obtainable, or milk which has been left to go sour and then putrefy, can be used with very satisfactory results. This trap should be used upright, not on its side, as in the illustration, which is only to show the type of funnel, etc.

Another effective trap is the one shown in the accompanying illustration. All that is requisite is five pieces of wood and a piece of gauze. The wood is first cut as shown, and between the two end boards A the wire is nailed forming a fly prison. After bait is spread upon the board the prison is lowered into the position shown in the upper figure. The bait is thus covered, save for the entrance each side at the spaces B. The trap may be made of any size, as the principle is the same in all sizes, and based on the fact that a fly in its efforts to get out of any enclosure will always fly or crawl upward. As shown in the detailed drawing, the fly crawls under the wire netting on to the white base board (painted white as an added lure) where the bait is placed. After feeding, the fly finds itself under an inverted V-shaped piece of screening,



ANOTHER TYPE OF FLY TRAP.

with half a dozen small holes along the top. It crawls up the sloping sides of the prison, or buzzes its way to the top until it finds one of the holes, through which it enters the trap proper which is simply a screened rectangle placed above the V-shaped piece over the bait.

Trapping the fly must be done, like everything else, in a thorough manner. Destruction of carcases must be carried out, as far as possible, simultaneously with the trapping, for otherwise flies are being bred faster than they are being trapped. The work should be carried on throughout the year, and the main localities where it will prove most effective are sheep yards, main sheep camps and tracks, watering places and any other spot where flies are known to congregate, *e.g.*, a patch of lignum, thick saltbush or scrub, etc. Also to do effective work the traps must be kept in thorough working order, and while they are catching, the dead or trapped flies must be constantly cleared out, and burnt, or otherwise destroyed.

Many specifics have been placed on the market as preventives and cures against flies and their damage, but the results achieved from them are for the most part inconclusive. Many have failed entirely to accomplish what is claimed for them, while the best are found to vary considerably as regards effectiveness. Some of the mixtures that can be made up by the sheep owner himself will probably give as good results as any, and the following dressings are recommended by experienced graziers :—

Three parts castor oil and one of turps. The turps kills the maggot, and the oil heals the wounds. Castor oil is a splendid healer, and its smell is most distasteful to the fly. It is a good basis for all dressings, and the addition of a small quantity of iodoform—sufficient to cover a sixpence—to the bucket of mixture will make the dressing still more unattractive and add considerably to its lasting quality.

Ten gallons Stockholm tar, 3 gallons draught castor oil, 3 gallons kerosene, ½ gallon turps. The quantity of stuff used should work out at about one gallon to every hundred lambs. The main thing is to put it on properly, well over the tail and in and around the crutch.

To one kerosene tin of fat add one quart of Stockholm tar and one quart of liquid (Little's) dip. They should all be heated and well stirred, and will make a good and inexpensive fly preventive at lamb-marking time. If marking in cold weather, keep the bulk supply alongside a small fire. A piece of bagging tied on a stick makes a good swab, and the proper way to swab is upward, *i.e.*, starting at the root of the tail, pass over it up on to the thighs and crutch. This means that the wound is nestled in a complete circle of mixture, and the thighs are treated where the blood lodges. It is painful to the lamb and useless as a remedy to try and swab down on the fresh cut. The purse should get a dab of mixture also.

For dressing off shears, take 2 pints carbolic liquid dip, 3 pints castor oil, 5 pints kerosene, ¼ oz. iodoform. When sheep are being put through, any that have been struck have wool clipped from the affected part, and the dressing applied with a swab.

A Western Australian owner gives his experience with dry arsenical powder dip as a preventive. He says:—" For several years I have found the method described below a very good one for preventing ewes getting struck, though perhaps it is only practicable with small flocks, up to, say, 5000 head. Get a deep, narrow tin, and punch a patch as large as a halfpenny of tiny holes in the bottom near one edge. Fill this tin with one of the poisonous powder dips, free from lumps, and see that the lid fits tightly. Two men are needed for quick work, one to hold the sheep, the other to use the tin. The one holding the sheep holds its neck against one knee, its flank against the other. The man using the tin parts with his left hand the wool about the top of the rump in nine places—three in front of the haunch bones, and six behind them—and shakes a little powder on to the skin in each place, and closes the wool up again, finally shaking a little on to the top of the wool to show that the sheep has been done. We get about a dozen at a time into a small pen and do them, turn them into a yard apart from the others, and fill up the pen again. Two men can do about eighty per hour in good yards, and one packet of dip is sufficient for 600 sheep. If the sheep are handled with reasonable care no harm is done even to ewes near lambing. The only drawback is that in a few cases rather too much of the powder gets shaken on to the skin, and then one finds at shearing time a small scab or sore spot in that one place, but this is a trifling injury. When the sheep are got in for lamb marking we first tail and earmark the lambs, and put them into another yard to rest, then dress all the sheep, dry ewes as well as others, as described above, and turn them into a big yard with the lambs for the night."

A most important point that must not be lost sight of is the destruction of flies when the trouble is not acute. This is just the time when they should be dealt with, as the destruction of one fly during that slack period means in all probability that there will be so many hundreds less to deal with later on. Apart from preventive measures, such as spraying, dipping, dressing and crutching. if the root of the evil is attacked—the breeding grounds of the flies and such flies as are unavoidably bred—there should be a big reduction in the working expenses of sheep properties. The methods that should be adopted are trapping adult flies, poisoning both flies and maggots in or on offal and carcases, supplemented by the dispersal of natural parasites that will attack the maggots that escape the poison and reach the pupal state. To render these methods effective, however, co-operation must be universal, otherwise no progress can possibly be made, and the sheep industry will continue to suffer to the extent of hundreds of thousands of pounds annually.

CHAPTER XIX.

STUD BREEDING.

Individuality—The Aim of Breeding—Starting a Stud—Purchasing a Sire—Character—Constitution—Introducing Fresh Blood—Where to Buy it ? —In-breeding—Line-breeding—Selection — Out-crossing — Reversion — Telegony—Stud Record-keeping—Systems of Breeding—Fold Development—Classing the Ram Lambs.

Stud breeding is really such a big subject that a whole book could be written about it, and even then little more than the surface would be scratched. However, there are a few important principles that can be outlined within the scope of a chapter, and these we will attempt to set out in as simple language as possible.

It may be taken for granted that the aim and object of stud breeding is to improve any particular pure breed to the best advantage possible. and the improvement of a certain type depends on local conditions and individual skill. This "individuality" is a pronounced feature of breeding.

Success depends upon the man who actually mates the stock, whether he be the owner or the manager. Rarely can two or more men successfully control a stud, because the whole secret is to have one ideal, and stick to it. It can thus be seen how essential it is that the man who takes a stud in hand should remain permanently at the head of affairs ; in other words, owners who do not take an active part in the management of the studs should stick to the men who have brought their flocks into prominence, or when choosing a man, they should see that he possesses every qualification for permanently filling the position. Breeding is a slow process, and the great essential, fixity of type or character, can only be ensured by continuity and individuality of management.

The whole aim of breeding is to develop the best characteristics of a breed, and make those characteristics hereditary. This can only be done by years of careful culling and mating for one ideal. Frequent changes of strains or types, and changes of management work dead against studs attaining any great prepotency. It is not an uncommon thing to see wealthy men buy the best rams procurable, and use them in high-priced flocks, yet they have never established a really fixed type, nor even have they obtained any really first-class progeny. The sire no doubt was worthy of its reputation and the figure paid, but the question whether it was not too violent a departure from his own type of sheep was either misjudged or ignored by the purchaser. The same thing may be repeated year after year, especially if there is frequent change in the management of the stud.

In many ways the breeding of high-class stud sheep is a natural gift, which cannot be learned or bought. Money cannot purchase the art, if art it is, for out of all the wealthy men engaged in the business there are very few that have attained the highest prominence. On the other hand, there are comparatively poor men, who started with next to nothing, and have acquired fame and wealth solely through the high standard to which they raised their flocks. Though money cannot buy the natural instinct of a breeder, it can do a lot towards the improvement of stock. It can command the services of a man who has the instinct and experience, and it can provide him with high-class, well-bred animals to work on, but viewing the matter generally, and taking into consideration the changes of fashion and seasons, stud breeding is not very often a profitable business. Most breeders enjoy popularity for a period of longer or shorter duration, but public demand is diverted to some other type or line of breeding, and the next man has his day. However, those few men at the top of the tree enjoy a comparatively steady demand for their stock.

Of course, a stud may be started either on a careful selection of flock ewes or by the purchase of stud ewes, but the sire should never be chosen from the flock rams. Provided a decent, not necessarily high-priced, stud ram, possessing sound constitution and good characteristics, is purchased, even if the stud is only formed by a selection from the breeder's flock ewes, presuming these to be well bred and of even type and good quality, it will be a start, and the stud, if properly handled, should go on gradually improving. At any rate the rams bred in it will be selected sires out of fairly good ewes, and not happy accidents that, even if they look passable themselves, may get anything, which is bound to happen to the man who uses sires selected from his flock rams.

The task of purchasing a sire is far from being a simple one. The man who can select a ram which will lift the stud nearer the ideal is a master of the art of breeding, for it is very widely recognised that such cannot always be detected by his looks or his pedigree. Of course, true conformation, unquestionable descent, and good constitution are all points in an animal's favour, so is a long pedigree of high standard, but even all these things combined may not make the animal the sire one would expect him to be. It is out of the question to attempt to select a sire on points, for no one can estimate the differences in character by this method, and *it is character that denotes the sire to a very great extent*, if he will bear examination, and his breeding is satisfactory.

Buying a sire is always an experiment, and to the breeder who has his heart in his work a most interesting one. However keen a judge he may be, he will sometimes be disappointed and deceived in his sires, but, on the other hand, he will sometimes drop upon one that will exceed his expectations, and will more than compensate him, and when he does, he should make the most of that sire, keep plenty of his ewes, and get his blood right through the flock. There are some rams whose stock is always unsatisfactory, however good the ewes are with which they are mated. It is well, unless great confidence is felt in a sire with regard to his breeding and in other respects, to use him only to a limited extent the first season.

The essential points to be kept in view are:—Constitution, form, flesh, wool. and character. Constitution is the foundation of everything. However perfect in most respects an animal is, all is useless without a robust constitution. All that indicates a good constitution should be sought after. Capacity of chest is absolutely requisite. There must be either width or depth of chest, but to secure a robust and hardy animal, there should be a combination of the two, with a deep shoulder, big girth and good underline. These points ensure plenty of room for the heart and lungs and other vital organs. The "conformation" of the various breeds has already been discussed in the chapters particularly devoted to them. With regard to flesh, which is of chief interest to mutton breeders, speaking very briefly, it must handle firm and springy; it must be laid over the frame in proper proportion, and there should be good development where the meat is most valuable.

Wool has also been treated in full elsewhere, and finally there is character. This is where the seeing eye comes in, and judging by points is quite impossible. Character gives the pedigree, as it were, without seeing the record. It sums up the whole breeding of the animal, as the same word does for mankind, although with a long and good pedigree there are always plenty of flaws. As with mankind, however, a good pedigree (by which is not meant an aristocratic one, but a worthy one of long maintenance) is by far the best guarantee of good character, so in animals we cannot expect to have satisfactory character without there has been careful and correct breeding maintained for a long time. At the same time, we must always keep in mind that a well-bred weed is just the very worst sort of a weed, because he has the power to stamp his progeny with his own defects, and that too possibly much accentuated. We want style and breeding by all means, but of themselves they are not marketable commodities, and we cannot afford to barter substance for a shadow.

Once having got a start, the next question that often confronts stud breeders with more or less limited means, or limited resources in the way of sheep, is, "Where to get the next ram to maintain the progress in the flock ?" Most breeders are probably aware of the alternatives that present themselves when occasions of this kind arise. They can decide to pin their colours to the theory of line breeding, and establish several families in their flocks from which to perpetuate corrective types of sheep. They can attempt the somewhat risky practice of in-breeding, and by mating closely related sheep establish a marked degree of prepotency, or they can go outside their flocks into the open market, and purchase a sire or sires calculated to advance their flocks in the desired direction.

Here is a really abstruse question for the young breeder to solve, because it is only experience, extending over a great many "sheep" generations, which can advise. In Australia, there are flocks which owe their present standard and importance solely to the fact that they have been carefully bred up within themselves, and have acquired a remarkable power to reproduce their own desirable characteristics. On the other hand, there are many stud flocks whose history reveals the fact that the greatest progress and the present standard of the flock was the result of the owner having had the courage and enterprise to go outside his own line of breeding when in search of sires. One can easily understand that the frequent introduction of new blood, especially if it came from a number of flocks of different breeding, would destroy the uniformity and prepotency of any flock, but it is desirable to confine the argument to reasonable limits ; in fact, to the introduction of just one very high-class sire from a different family of Merino, but, of course, similar in type, and used to similar climatic conditions.

It will be seen then, that to the young stud breeder, a very puzzling question is propounded, and we believe that the safest advice that can be given, until he feels in himself sufficient confidence, born of years of experience, to make possibly risky experiments, is to go back to the same source from which he obtained his original sires, provided, of course, they proved satisfactory. He should not go into the open market and buy a certain ram just because he happens to have taken a prize at a show, or because he has a particular fancy for a particular sheep not like his own, or not even any blood relation. The young breeder should be content to go back to the stud breeder who breeds the same kind of sheep he is breeding, and of the same blood, until he is so sure of his ground that he can breed his own stud rams. In-breeding is a two-edged sword, it cuts both ways, and that is one reason why the young breeder in search of a sire should go back to the original source for his ram, as he would then obtain the same blood without mating close relations.

Another hint is—do not be influenced against your better judgment in the direction of buying inferior stock, just because they are cheap. They are bound to prove the most expensive in the long run, for the harm that can be done in a stud by the introduction of a bad sire has a very far-reaching effect. If a bad sire has such a wide influence for evil, a good one has a correspondingly wide influence for good, and the decision between the two should not be affected by a few pounds at the time of purchase.

A few paragraphs back, the terms "line-breeding" and "in-breeding" were used, and it may be as well here to go a little more fully into the meaning of those terms, and the advisability or otherwise of adopting the systems they represent. "Line-breeding" is breeding from the same blood, or within the same family, by selection (but not from such close affinities as parent and offspring, or brother and sister), while "in-breeding" is really intensified "line-breeding," or the mating of the closest relations within the one family. Even these definitions are not quite satisfactory, for the point where line-breeding ceases, and in-breeding begins, is difficult to determine. It has already been pointed out that for the beginner the safest procedure is to procure his rams from a constant outside source till his stud is well-established, but once that point has been reached, the question arises as to whether greater progress could not be attained by the adoption of one of the above systems than by the continued introduction of outside, and especially different, strains of blood.

The foundations of our best breeds of domestic live stock lie, to some extent, on the principle of in-breeding. The great Bakewell, who did so much for the Leicester sheep, was the pioneer of this theory. The majority of the great stud flocks of the United Kingdom, Australia and New Zealand, are self-contained, and rarely go outside themselves for new blood or sires. The principle, therefore, is unquestionably sound, but the difficulty is to determine to what length it may be carried without going too far. It is a dangerous weapon, and can only be safely used in the hands of experienced and careful men. What it actually does is to enlarge all the characteristics of the animals bred, and to give prominence to the merits and faults of the particular family used, whether those merits or faults are those of constitution or anything else. Therefore we believe that a modified form of the system, or in other words, "line-breeding," is the best to adopt; it is less drastic and safer than intensified in-breeding. It does not necessarily mean the pairing of animals very closely related to each other, but the mating of the same families two or three generations removed. By this process, if the necessary judgment is exercised, fixity of type becomes more strongly marked, and a wonderful degree of prepotency is obtained. But the success of the whole system hinges upon constitution. If any of the characteristics which denote constitution are ignored, a closely line-bred stud will go to pieces rapidly. Wild animals in their natural state breed amongst themselves, and nature would not permit this if it meant the deterioration of the species. But she safeguards herself by establishing the great law of the wild kingdom—the survival of the fittest, so that only the strong constitutioned ones survive the struggle to live, and the weak ones go to the wall. This is the discriminating power man has to exercise when he attempts in-breeding or line-breeding with domestic stock.

In very close in-breeding, selection is not always possible, and selection is the safety valve of the system; there are not enough members of the family to select from, that is to say, the circumstances sometimes prevent the throwing out of individuals with the prevailing faults very prominently stamped on them. At all times it is preferable to have a comparatively small stud, and run it on a clearly defined system, rather than to have a big stud with innumerable families. There is, after all, a limit to what men can successfully look after, and while it is a comparatively simple matter to in-breed in a small stud containing about four families, it becomes almost impossible for a man to carry out a definite plan in a large stud comprising many families. In nearly every system which produces good results, there are extremes either way, which are best avoided, and probably more harm can be done by injudicious in-breeding than by the indiscriminate use of outside strains. One system that can be adopted is that of keeping four families in the stud—A, B, C, and D. Mate males and females from each in regular rotation. For instance, rams from A family are mated with ewes from B. Rams from C are used on the progeny, and D rams are used on C's progeny, which in their turn are put back to A.

On the interesting question of "out-crossing" little need be said. There is a certain amount of difference of opinion regarding the subject, and the young stud breeder, as he progresses along the path of his absorbing science, will develop his own views regarding it. Out-crossing really amounts to the introduction into a stud of an animal of the same breed, but from a flock founded on different blood. It is a recombination, so to speak, of existing characteristics, and personally we believe that in the hands of a thoroughly practical breeder, no damage, but good, may often result from a judicious and occasional out-cross—say once in a decade or even longer—with a sufficiently strong and vigorous sire, but a good deal of risk attaches to it if undertaken by a novice. There is the danger that the offspring will not blend the two parental kinds into one mixture, but take after some remote common ancestor. This is "reversion," and generally exactly what the breeder does not want to produce, for it may be to ancestors so remote as to make it problematical whether any of the desired characteristics of the breed will be maintained.

"Reversion" is sometimes confused with "telegony," one of the most fascinating questions connected with breeding. Briefly, it is the influence of a previous mate or sire affecting the offspring of a later one, mated with the same dam. High authorities, such as Professor Ewart, do not believe in the existence of such influence, but others are strong upholders of the theory that previous impregnation does affect subsequent progeny, and consider that it is sufficient as an occasional factor to make indiscriminate mating a very undesirable thing where the dam is sufficiently pure in her breeding to warrant her inclusion in a pedigree stud.

Stock owners who happen to be keen observers have for ages seen instances of what appears to be telegony, though it is only in comparatively recent years that it has come before the world for serious consideration, scientific and otherwise. Breeders of racehorses have been the principal lay students of this subject in recent times, and there is a growing idea among the more careful observers in the profession of stud keeping that it is essential to the purity of blood for mares of aristocratic lineage to be kept untainted by sires with questionable pedigrees. "It is my conviction," writes Day, in his book on the horse, "that no mare should, under any circumstances, be put to an inferior stallion, for without going so far as to say that many of her foals in after life will resemble the sire of her first produce, and partake of his qualities, good, bad, or indifferent, there is no doubt whatever that the subsequent offspring of a brood mare is and may be affected by the fact of intercourse with some previous sire."

Some sheep-men, we know, refuse to use a ewe for pure breeding that has been previously crossed by a ram of another breed, and the Council of the Southdown Society of England only a year or two ago resolved that Southdown ewes that had been mated with rams of another breed should not be eligible for registration in the flock book. An interesting and authentic case bearing on this point is given by Mr. Arthur Laird, of Murray Downs, Swan Hill, N.S.W., who says:—" Some years ago I had some stud Merino ewes, which were served by a Southdown ram that got through the fence, and fifteen of them had lambs to him. I put those fifteen ewes out by themselves and joined a stud Merino ram early for December lambs. They nearly all produced lambs and six or seven of them showed Southdown markings."

Another instance was quoted recently in "The Pastoral Review," in which a grazier purchased about 100 comeback ewes (not maidens) from a farmer who had a Southdown ram. The most of these were in lamb to Lincolns before coming into the latter's possession, but about twenty of the last to lamb were served by the Southdown ram. The grazier kept all, or nearly all, of these ewes, and joined them with Lincoln rams the next season, and about eight or nine lambs showed unmistakably the markings of the Southdown, and some would have passed for half-breds. These two examples of telegony would indicate great prepotency in the Southdown. It has certainly been found in New Zealand that Merino ewes, used for breeding half-breds, and again mated with Merino rams, have thrown their Merino progeny pure. On the other hand, some breeders who keep two stud flocks, have been known to cross their cull ewes with some of the other breeds, in order, as they considered, to spoil them from breeding true in the hands of anyone who might pick them up cheap in the saleyards.

With regard to a system of stud breeding, it is practically impossible to lay down any hard and fast rules. Individuality and the faculty for observing correctly are probably the leading characteristics that go to make a successful stud breeder, and they rest with the man himself. He can never be taught them. Of course, the most important point is proper mating, and for this purpose every ewe should be looked over for any faults or special good points, and put to the ram that will remedy or improve. Keep a rough yard book as well as a stud book beside you. Refer to the past history of each ewe, and a guide is obtained: enter in the rough book a complete list of ewes for each sire, and having classed, work out all numbers in consecutive order in the stud book. At marking, when the lambs are caught, the sex and dam are noted, which is all that is necessary until the regular stud book is posted up.

Naturally, different men have different ideas on the subject of stud record keeping, but the following is a system that has been found satisfactory, and fairly comprehensive. The books are long enough to take 35 numbers on one page, and the larger of the two used is wide enough to include records for six years at one opening. Two sets of ear labels are necessary, one being used when the lambs are mothered, having the name or number of sire on the face. When the ewe lambs reach the breeding age these labels are removed, and the permanent stud label inserted, the latter having the name of the stud on the face and the stud book number on the other side, the ewes as they are numbered being entered up in the large book. The whole of the records can be kept in one book, but it will probably be found more convenient to have another and a smaller book for mothering purposes. The large book contains the particulars in the smaller book, and all other necessary records.

Owing to labels occasionally being torn out of the ear, there are also distinctive earmarks for each sire, and these are noted in the mothering book so that the pedigree of one side is always identifiable.

			1918.					1919.				
No.	Late No.	Pedigree.	Remarks on Ewe.	Ram.	E	R	Remarks on Lamb.	Remarks.	Ram.	E.	R.	Remarks.
1	7 by 10	200.2—14.20 —6.5, &c.	4 yrs. old Special	18	—	5	Sold 1920	Lost lamb	18	—	—	—
2	15, 10	180.2—76.18 —3.5	—	—	—	—	—	Maiden	36	4	—	Culled 1921
3	74.8	15.42—10.5 —15.24	Culled 1920 Maiden	36	73	—	Died May, 1919	—	36	—	120	Culled 1920

Explanation of Record of Ewe No. 1.—Mothering number, 7, by ram No. 10. Pedigree—Out of No. 200 by 2, out of 14 by 20, out of 6 by 5. Age—4 years when first put into stud. A specially good ewe; went to ram No. 18 in 1918 and had a ram lamb No. 5, which was sold in 1920. In 1919 lost her lamb to ram 18. In 1920, particulars of which are omitted in the above table owing to lack of space, it may be stated, to complete the example, that she went to Ram No. 10, had a ewe lamb No. 7, which was, when old enough to breed, put into the 1st stud flock. It will be understood that the column headings for 1920 are, of course, the same as for the previous years given above.

The columns for pedigree can be left much wider than is shown in the accompanying sample page, and six years' record can be obtained at one opening. The number or name of ram to which the ewes are put is entered in black if put to ewes in the spring, and in red if in the autumn, likewise the number of the lamb. Culling and casting for age are also noted in red, and the number of the ewe marked off in red.

Rams when kept for use are numbered on the horn, and the original label left in the ear. The smaller, or mothering book, previously mentioned is very simple, as will be seen from the following sample. The distinctive earmarks of the sires, already referred to, are also shown.

MOTHERING BOOK.

SPRING, 1920.

150 Ewes put to No. 18 by ——, from 23rd Oct. to 30th Nov.

No. 20 by 10 by ——, with them 3rd Dec. to 12th Jan., 1921.

	E.	R.		E.	R.
6	—	1	45	2	—
8	6	—	58	lost lamb	
10	4	—	64	7	—
14	Dry		&c.		
26	—	3			

No. 18's lambs marked with back notch, near ear.
No. 20's two front notches, near ear.

Another system, recommended by a Queensland stud breeder, is the following. He says :—" I may state, by way of introduction, that all lambs dropped from first stud ewes (with the exception of any obvious culls) are, when tailed, numbered with metal ear-labels and entered in the stud book, which contains columns for date of lambing, sire, dam, and remarks. The method of mothering and marking lambs is as follows :—The ewes served by different rams have a distinguishing brand, either wool brand or coloured labels in ears. One or more lots are put out to lamb together, but in no case should there be many more than 100 to lamb in one paddock, as it is impossible to mother larger lots satisfactorily.

" Take off the lambs into a small pen alongside the ewes, and, if dry ewes are not already drafted out, it is as well to take them out. Then watch the lambs and ewes, and keep throwing out the former as their mothers call them and they answer, or letting them into the ewes three or four at a time and watching them till their mothers take to them. As each lamb is mothered put a similar raddle mark on mother and lamb, and draw off into another pen. Upwards of twenty pairs can be put into one pen without going in for many fancy marks. When all convenient marks are exhausted, start another pen. Keep to same system in marking, so that you can remember which is the last mark used. When all are mothered bring in each pen of ewes and lambs. When one man catches a lamb another careful man, told off for the purpose, catches the ewe with similar mark, and calls out the number of the dam, which is duly entered in the stud book, along with the number of the lamb and the name or number of the sire. A rough book can be kept for this purpose, but personally I enter straight into the stud book in pencil, and ink in afterwards. Two men to catch, one to mark and tail, and one to write down pedigree, &c., are all that are required."

An expert classer and breeder, who writes under the nom-de-plume of "Talgai," in "The Pastoral Review," gives the following valuable advice on breeding and record-keeping :—

"Having purchased the necessary ewes and rams, and the idea being to improve them by careful selection, it is necessary to establish a system of keeping the records and pedigrees of each animal. This work of breeding by selection requires large experience and a natural aptitude, everlasting care, and attention to details.

"As it is obviously impossible to have all the ewes equal in degree, it is necessary to have certain arbitrary standards. For instance, say the flock of ewes is 2000. Of these, generally speaking, there would perhaps be 250 first grade, 600 second grade, the remaining 1150 third grade. In these 250 there will be varieties of wool, form and faults. These will then be classified into, say, five lots each, as even as possible, but distinct in some characteristic from the others, and mated to a ram which it is hoped will result in the progeny to some extent being nearer the standard desired than their parents. Any ewes that stand right out from the foregoing could be specially mated with the best ram available, and receive extra care.

"Proper precautions must be taken to see that all the fences are secure so as no intermingling of flocks is possible. Put a distinguishing brand on each lot of ewes. and also brand the ram or rams with the same brand that corresponds with the ewes they will be joined to. Each lot of ewes is lambed separately and kept so until after marking. When the flock is brought to the marking yards, run off the lambs for a couple of hours (no longer), and then drop one lamb at a time into the ewes, and when he finds his dam, catch her and the lamb. Take a record of the tag number in the ewe's ear, put a tag number in the lamb's ear, then dock the tail, and turn into another yard. Have two sets of running numbers, one for each, rams and ewes.

"When these lambs are old enough to class it can then be ascertained which sires are getting the best stock, and which ewes or pedigrees or blood of ewes are suiting inversely or nicking in with the rams, and thus some guide established. This process is repeated yearly, *ad infinitum*, and these sheep can be called the 1st Stud or Pedigreed Stock.

"Now, with regard to the second grade, viz., 600: It is not generally possible or payable to attempt to pedigree too many.

These second grade stud ewes are high grade quality sheep, and it is hoped to breed from them rams of a sufficiently high class to act as sires to the third stud ewes, and leave a balance of good, useful rams for sale to buyers wanting high-class sheep, but not prepared to pay big prices for pedigree sheep. These ewes must be yearly and heavily culled and classed, and can be run in one mob with, say, two per cent. of rams. At marking time the lambs can have a small notch put in the back of the ear near the butt.

"The third-grade stud ewes are either to produce flock rams for sale or good wethers, and must be consistently classed and culled. No special earmark is allotted to them.

"There are other systems more elaborate, but the less complicated the better, as if there has to be a change of management, the reins can be more easily picked up by the successor.

"It is a good plan—in fact, necessary—to adopt a standard of brands and earmarks to represent certain qualities; stick to them always, and they then become ingrained in one's mind, and save confusion and mistakes.

"A good system of marking for the foregoing would be as follows, branding the rams the same as the ewes they will be joined with. First Grade, say five lots:—

"A" Flock	A	on back
"B" ,, ...	B	,,
"C" ,, ...	C	,,
"E" ,, ...	E	,,
"S" ,, ...	S	,,
2nd Grade Studs	II	,,
3rd ,, ,, ...	X	,,
All unclassed sheep	——	,, until classed.

"Note.—All the letters are quite distinguished, to avoid mistakes with faded brands.

"As all very high-grade are named, these flocks will probably be known by the ram, as the ewes branded 'C' called, say, President's ewes.

"In using labels, a plain number is the best; dates on them are unnecessary, and very often get wrongly used. The owner's name should be stamped on the back. In a big stud, after the numbers get over four figures, start at one again, and have an 'A' preceding, as 'A564.'"

The young breeder, as he moves among his fellows, is liable to be rather exercised in mind over the question of fold development in stud sheep. He is bound to hear conflicting opinions, and viewed broadly, the claims of each camp will appear to be warranted to a certain extent, but he can solve the difficulty if he bears in mind that on both sides there can be extremes, which can never result in successful breeding. Rams can be too plain, and have such light necks and thighs that their progeny fall away to nothing as far as weight of fleece is concerned. On the other hand, rams can be so handicapped by tight body wrinkles, heavy jowls and woolly heads that they have not the constitution to feed themselves, much less get strong-constitutioned stock. Neither type of sheep is profitable, but as in everything else, there is a happy mean, and while good neck folds and bold fronts are considered necessary in stud sheep, tight body wrinkles are condemned. At the same time it will be borne in mind that if a little more density is required, one or two slight folds in a sire will do good, because folds are associated with density, a point that has already been touched on in previous chapters.

In flock sheep, however, there should be no development of the kind referred to. Good necks are required, but any tendency towards body wrinkles, very woolly heads or heavy jowls, should be watched and steps taken to eliminate it. The ultimate object of stud sheep breeding is to raise the standard of the general flocks. Good profitable fleeces are required on ordinary station sheep. These can be obtained by the use of flock rams possessing density in a more exaggerated sense, and flock rams of this class can only be produced by stud rams possessing density in its most "concentrated" form. Thus it will be seen that the characteristics of stud sheep are considerably toned down in ordinary station sheep.

In conclusion, a few words may be said about that most interesting task of the stud breeder's year's work, the annual classing of his ram lambs, when he is able to gauge the progress he is making as a breeder, and to speculate somewhat on the future. It is not difficult to describe the operation of classing, but no ink or paper can lay bare that knowledge which sends the sheep into their different grades. For all men work on different lines, and very often a fine point decides which class a ram is to go into, and far-reaching results may be the outcome of that decision. The ability to detect that fine point depends upon the combined action of inherent aptitude and experience. Before the young rams are brought to the classer, they are overhauled and are shorn round the pizzle to prevent trouble in the future. This is a simple task, but it should be done with intelligence and care, because a large percentage of the rams classed are sold as studs, or various grades of flocks, and it is not sensible to disfigure them unnecessarily underneath. It is not necessary to shear much behind the pizzle; all that is required is to remove the wool immediately covering it, and a little in front of it. While the rams are turned up for this purpose, it is just as well to see if they require any trimming round the eyes, or if the hoofs require attention, &c. Having passed through these ordeals, the sheep is then carried to the classer and placed on his rump, belly upwards between the classer and his assistant. Even while he is being carried to him, the classer with a quick glance sums him up in regard to his head, face, and horns, and after examining his covering underneath, also his mouth, he is placed on his feet and thoroughly overhauled as far as general covering is concerned. The classer then makes up his mind, and names the pen into which he is to go.

As regards the number of classes made, naturally a great deal depends upon the size and standard of the flock, but it is a general rule to make about three classes of flock rams, and, of course, have pens for tops and culls, that is, five classes altogether. The tops are undoubtedly the most interesting class, for they represent most truly the type the breeder is aiming for, and they comprise the best points in that particular crop of ram lambs. They are very critically examined before they are classed as tops, but such changes take place in young sheep that even when classed again as 4-tooths the classer may find cause for reversing the decision he made twelve months before. Now it is very easy for a man to set too low a standard for his tops, and whoever yields to that temptation loses ground at once. From the tops in a drop of ram lambs the workers of the future have to come, and therefore that class should contain only those sheep that are unquestionably the best. Then the other grades require special care and attention, because evenness is a matter of great importance. As a rule the flock rams are graded into prices, and it makes all the difference to the breeder's pocket and his reputation if the rams have been well and evenly classed.

A great point in classing is consistency. Working on sound lines and with uniformity year after year with rams as well as ewes, it can be readily understood that in the course of time the numbers in the pen of tops bear better proportion to the numbers in the pen for culls. The difference is also noticed in the intermediary grades. The desired characteristics become more generally established, and though the keen watchful eye of the classer is ever needed, and the gate of the culling pen should be ever open, the standard of the flock is raised.

CHAPTER XX.

GENERAL NOTES ON SHEEP MANAGEMENT.

Lice in Sheep—Sheep Returning from Agistment Country—The Use of Dip against Lice—Stock in a Fire—Caught in Flood Waters—Grass Seed—Ophthalmia—General Notes on Sheep Dogs.

LICE IN SHEEP.

There are one or two matters we would like to refer to before concluding these chapters on sheep management, matters which, though not of unanimous interest, are still important enough for a reference here. One is the question of lice, a parasite that is a great curse among sheep, and the cause of heavy monetary loss running into hundreds of thousands of pounds. Strangely enough, in many parts it is not taken so seriously as the tick, although, as a matter of fact, the louse is the more serious of the two pests, not only on account of the damage it can do in a flock, but because it extends its depredations beyond the climatic barrier which limits the operation of the tick. Fortunately, it is a trouble that can be prevented without great difficulty, for as in the case of ticks, careful attention to dipping will completely rid sheep of lice and check an increase of the pest.

The photo of lice-infested sheep on page 316, will show what terrible conditions the pest can set up. When the picture was taken, the sheep had been on good feed for months, yet they lost condition, and in wool on any part of the skin examined from 30 to 50 lice were seen. The wool was plucked from the sides by the teeth, and from the shoulders by scratching with the hind feet. The irritation was maddening and constant, and lice were found in the locks of wool on the yard fence against which the tortured sheep had rubbed themselves. This is an example of how sheep on good feed can be affected when attacked by lice. It is estimated that their value was depreciated by at least 50 per cent.

In times of drought, when sheep are sent away from clean country on agistment, it is always advisable, on their return, to make careful investigations, as they may very probably be lice-infested. The little pests are very small and hard to see, only about 1-30th of an inch long, greyish pink in colour, and lying close to the skin. A most likely spot to look for lice is just about the front of the shoulder blade and on the side of the neck. Do not look on the wool fibre; only eggs will be seen there, but right on the skin, which is where they usually reside (as it is a place where the sheep cannot readily disturb them). In very hot weather, however, they are likely to be found on the fibre, but in any case, when looking for them, open the wool wide with direct sunlight on it. On a dull day an ordinary pocket lens will reveal them.

Merino Sheep Badly Infested with Lice.

In districts where there is risk of lice infestation, sheep owners should remember that one opportunity, and one only, presents itself for guarding against the pest. This is at dipping time, and if the opportunity is not made the most of there is grave possibility of the sheep becoming heavily infested with lice when they are carrying six months' wool or more.

Whilst the standard non-poisonous (Cresylic Acid) dips will kill lice alive on the sheep at dipping time, they have no lasting effects, and consequently have no power to destroy the young lice that hatch out of the eggs, or to protect against re-infestation. Therefore in districts liable to lice infestation, sheep owners should select one of the reliable arsenical powder dips, and use it very carefully according to directions. An arsenical powder sheep dip of good reputation remains in the fleece for months after dipping, in sufficient strength to kill the young lice that hatch out of eggs and prevent re-infestation, should the flock be brought in contact with lousy sheep. Bearing this in mind, it logically follows that the sheep should not be dipped too soon after shearing, because the more wool on at dipping time the more dip will be taken out in the fleece—and the greater the protection. When dipping for lice, therefore, it is advisable that Merinos should have from six weeks' to two months' wool on—and crossbreds from eight to ten weeks'.

SHEEP OVERTAKEN BY FLOOD OR FIRE.

Another phase of management that has not yet been dealt with is that in connection with stock overtaken by flood or fire. Sheep, once caught by fire or water, will not budge. In the case of a fire, if they cannot be got to a place of absolute safety beforehand, the best thing to do is to let them bunch up, burn all round them, and if possible get into the middle of them with a dog, which, if properly done, should prevent the smothering that often takes place owing to the smoke and close packing. A few of the outside ones may get burned, if there is no time to ring them in order to trample down to powder the dry pasture. The man doing the job must, however, keep his head, or he may be smothered and the sheep roasted. If the sheep should be on a camping patch, leave them there, as it is usually devoid of the most inflammable material. It is practically impossible to drive them to a place of safety, once terror of the fire has laid hold on them, and when the fire has passed, they should not be moved until the ground cools a little, or there will be many burned feet and permanently lamed sheep.

Sheep also require a large amount of good judgment to avoid loss when caught in flood waters. If they stand long in water they become affected with rheumatism so acutely that they cannot move. In this contingency, the only thing to do is either to boat them to dry land, or carry them out, either on one's back or on a stretcher made out of wheat bags (chaff bags are too fragile), stretched across two handy poles and large enough to hold two or three sheep with their legs tied. Two men can carry them a long distance, and wade through deep water with ease and safety. When the sheep have been brought to dry land, should any show signs of rheumatism, rub their knees and hock joints hard with a piece of strong bagging ; the friction brings the blood and muscles into action and they soon recover. While the rubbing is going on, turn the sheep from one side to the other, and when they can stand, rub up and down the legs till they are able to step out.

Grass Seed.

A serious trouble that often affects flock owners, particularly in good seasons, in Australia, is grass seed working into the skin and tissues, and sometimes even vital organs of their sheep. Prevention is the main consideration, as there is really no cure for weaners that are suffering severely from this cause. If they could be placed on soft green feed they might improve a little, and be worth shearing later on, but when weaners are badly seeded, poor and weak in condition, and perhaps blind or partly blind, the most humane and at the same time the most profitable treatment is to kill them for their skins.

In dealing with the question of prevention, it is advisable to feed down paddocks before and during shearing, so that there will be safe areas on which there is only a short growth of grass for lambs to run on after being weaned. Provided the weaners can be kept out of long grass until the seed falls, they can then run on country where seed has fallen without any serious injury to themselves, although they are sure to pick up some when camping. If the paddock or paddocks made safe for weaners as above suggested are found to be too short of feed, then it will be necessary to provide them with some hay; but if the management has been careful there will be, more than likely, sufficient grass to see the weaners over the seeding period, which as a rule is only a matter of a few weeks. An Australian sheep manager of long experience gives some good advice in "The Pastoral Review" on the subject of combating the grass-seed trouble. He says:—

"A paddock may be in good order to receive weaners, except perhaps for a few patches of long grass. These danger spots could be fenced off with a temporary two-wire fence; or the patches could be mown, or dogs could be fastened at points where most needed to scare the weaners away from the seed areas. If dogs are used they should be visited daily to give them a run, and to ensure their having a supply of feed and water. Other ideas may suggest themselves, such as shepherding the weaners on safe areas and yarding at night during seeding time. Any trouble is worth while that will save weaners from seed.

"Artificial feeding of weaners during the seeding period is, of course, the most satisfactory way of keeping the young sheep safe. Sufficient hay grown for this purpose will repay itself many times, as the weaners can then be kept free of seed, and if the hay, oaten for choice, is good they will not go back much in condition, as young sheep often do when weaned on to natural, but dry, feed. Lucerne paddocks are still better for this purpose, but they can only be provided under favourable conditions of soil with, as a rule, water available for irrigation. Green lucerne is particularly useful for all classes of sheep, but more especially for young rams, which do especially well on it, and continue to grow when weaned, which is a very important consideration. As regards seed in older sheep, this is more or less unavoidable in good seasons. The older sheep will not, however, get seeded as badly as weaners do, because aged sheep will keep out of the long grass, whereas weaners will go through it with their heads down, collecting seed with every movement; it is only when the whole area in the paddocks is covered with long grass that older sheep suffer seriously.

"In dealing with sheep that are seeded, the first thing to be done is to yard them, and get the seed out of their eyes with tweezers. If seed is thick round the head or other points it should be cut away with shears, and the sheep should then have a swim through a river or creek if available, or failing that through a tank or dam, or through a dip, and in the latter case, a little disinfectant or non-poisonous dipping fluid of a strength sufficient only to kill any poisonous organisms in the water from previous sheep, should be added. A swim is absolutely essential if the sheep are to make a good recovery, *and they should have it before the seed has had time to work through to the skin.* Sheep, and especially weaners, that are weak or blind, should not be put through the water together with strong sheep, but treated separately, and kept in a small paddock for frequent inspection and further treatment as considered necessary. Care must be taken not to dip any badly-seeded sheep, especially rams, in an arsenic or other poisonous dip. A case is on record where an owner lost several hundred rams in this way.

"Badly-seeded sheep on a run is often a sign of ineffective management. As a rule it is quite possible to provide for the safety of the weaners by taking the matter in hand early, when the season and rainfall have made it practically certain that a heavy growth of feed may be looked for in the spring. Small lots of special sheep or studs should be kept safe, even if it is found necessary to yard and feed them during the seeding period."

OPHTHALMIA.

Grass seed is responsible for much blindness in sheep, and the same trouble, or ophthalmia, is also caused by travelling through dusty country and the intrusion of any other foreign body to the eye, such as pollen, flies, etc. The ailment can be detected by a running, usually followed by a white scum, which eventually thickens until the pupil of the eye is completely covered and total blindness ensues. First of all, separate the affected animals from the healthy ones, and keep them apart. Then remove any irritating body, such as grass seed, which may have obtained entrance to the eye, either with a soft clean feather or a camel hair brush or a pair of wooden forceps. Then inject a few drops of the following lotion :—1 oz. laudanum, 3 drs. sul. zinc, 1½ pints pure water (this will about fill a brandy bottle), or 5 drs. sul. zinc, 1 dr. cocaine, to same amount of water. The best method to get the lotion into the eye is per medium of a sewing machine oil tin, and a cork put on the nozzle enables it to be safely carried in one's pocket, so that when an affected sheep is found it can be caught and dressed. Before the lotion is put into the tin it should be well shaken up, and each boundary rider should be armed with one of these tins in addition to the forceps in grass seed time.

Another method is to blow into the eye once daily boracic acid in fine powder with an indiarubber puff. For valuable stock the following may be tried :—Place the affected animal in a darkened stable during the day and bathe the eye with a saturated solution of boracic acid in clear rain water. This lotion may be changed for one composed of 1 per cent. nitrate of silver after all pain and heat disappear.

Sheep Dogs.

There are, of course, many other diseases of sheep regarding which the young flock owner should have some rudimentary knowledge, but we shall defer consideration of them for a little while. In the meantime a few words regarding sheep dogs may not be out of place. The importance to sheep owners of having well-trained, intelligent dogs to work their sheep cannot be over-estimated, and in choosing or breeding pups it should be seen that they are from the best working strain obtainable. The chief qualifications to look for are—a natural ability to run out freely, to lift sheep carefully, handle them gently yet firmly in a steady, forceful manner, together with a nice eye and an inclination to lead. Having secured the pup, he must be well reared ; the brains and intelligence cannot be utilised to the fullest extent unless implanted in a frame of well-nourished bone and sinew, capable of enduring hard work.

Mr. Jas. Lilico, of New Zealand, an authority, says, in "Breeding and Training of Sheep-dogs" :—"About five months old he begins to follow, and his education starts in earnest. He must not run along with another dog, nor yet on scattered sheep. A few are steadied near hand by an old experienced fellow, and the pup is given a chance. He may run round and drop beyond. No more could be desired. An encouraging clap is his reward, and his owner's imagination conjures up visions of a dog of the coming day. But he may not run at all. Worse still, he may " run in," and give a demonstration that savours more of scatter than gather. Pups have been known to do this and turn out all right. . . . .

" Any attempt to force a beginning into doing only blunts his genius and retards progress for a time, if not for ever. Persuade him gently, and take him until he makes a decent beginning, and reveals himself a little. When pressing work has to be undertaken in a hurry, the best plan to cope with the pup's awkwardness is to put him on the chain. This teaches him to keep at heel when other dogs are working. He is taught one thing at a time, first to run round the sheep ; whichever hand he prefers he is allowed to take, and usually sticks to that particular side only until he grows keen, when he may be induced to run to either. In running round, I like to see him lie well out ; in fact, the young dog cannot run too wide for me, so long as he is under control, for practice, and plenty of it, will bring him close enough. Then he must halt when he ' keps' or lifts his sheep ; if possessed of a strong eye he will clap, but a dog may have a good eye with nice style and keep his feet. Whatever his style be, it is imperative that the halt be made when he is far beyond.

" Every trainer," says Mr. Lilico, " has his own method of directing and commanding. One has only to witness a trial to observe this. The important point is a certain word or whistle for each move, and stick to it. In order to assume proper command once the puppy is fairly started and keen, everything he is bidden to do he should be firmly led to understand he must do. If allowed to slip once, he will indulge again, and soon form a habit. The least sign of vice should be curbed while he is in the very act of perpetrating it, but he should never be seized and thrashed, for this must necessarily take place after the offence is committed, and the chances are he has no idea what it is for. His temper must be carefully studied, and this is where the science of the master hand comes in, the process of meting out the exact measure of rebuke necessary to eradicate any roguish tendency, while still retaining the confidence of the pup, and fostering and encouraging the desired qualities.

" The trainer who would successfully accomplish this must begin by training himself—to control his temper and cultivate the virtue of patience. If sheep come away when lifted the pup is allowed to follow. The ideal follower is the one that centres straight up behind, with no wearing from side to side. Should sheep be stiff and dour, he should not be urged on too much, for he is apt to come with a dash. This is one of the difficulties to be reckoned with in the dog with a very strong eye. The only way to avoid the dash is to let him lie, and dodge away nearer until the sheep move. I never grudge the time, patience, and perseverance spent on an extra wide run youth, who lies back when sheep stand. If there is any pith in him at all I can always rely upon him gradually (for it must be done by degrees) acquiring the art of coming steadily on with power enough for almost any emergency. . . . The distance out may be extended as the pup becomes efficient at hand. . . . Many good dogs at hand lift severely at a distance. If he lies out with a fine sweep, and lifts gently, this shows his instinct truly and naturally, but should the lift be rashly done, the next best move is never allow him further out than he can be commanded."

The training of man's "faithful help-mate" is a subject that is full of fascination, but after all, even were the last word written that might be written on it, success or failure must depend upon the trainer's own judgment based on actual experience and genuine love for his collie and his calling.

CHAPTER XXI.

DISEASES OF SHEEP.

Stomach Worms—Preventive Measures—Fencing off Swampy Country—Draining—Burning—Drenching—Recipes for Drenches—Specifics—Lung Worms—Intertracheal Injection—Drenching—Licks—Other Measures—Giddiness from Tape Worm—Footrot—Symptoms—Treatment—Paring—Footbaths—Hand Dressings—Anthrax.

A great deal of trouble and expense can be often saved if a stock owner, by a little practical observation, can tell when his stock are not normal, that is, when they deviate from a healthy standard. He may notice that there is something wrong, but to judge accurately what the particular ailment is from the premonitory symptoms often comes within the province of the expert. A little common sense, however, will bridge the difficulty when there is no professional man handy. It is always a wise plan when a number of stock are noticed ailing at the one time, or any of them die, to isolate those alive, and effectually destroy the dead. Move the unaffected to fresh, and at times, if circumstances point that way, to poorer pasture than that on which the stock have become sick, especially if they are in good condition, but if they are poor, move them on to better and richer pastures. The great thing to do is to become *au fait* with first symptoms, and the first step towards that is to be absolutely conversant with stock in the pink of health, as the practised eye will soon detect any deviation from that state. There is always a brightness about the countenance of a healthy animal that is never present in an unhealthy one. All such rough and ready signs, however, require experience. Constant attention is very essential in gaining a good knowledge of ailments, but one can be attentive without being aggressive, moving quietly through the stock without unduly disturbing them.

STOMACH AND INTESTINAL WORMS.

We will now proceed to deal with a few of the chief ailments from which sheep suffer, beginning with worms, unfortunately a very fruitful source of trouble and loss. Worms are of innumerable kinds, but in the limited space available, it will be sufficient to deal with the most important, stomach and intestinal worms and lung worms. To discuss fully the various types of these and other kindred parasites would require a book in itself, so we will devote our attention to a general study, beginning with stomach worms. The life cycle of these parasites is a simple one, and the following broadly represents it. The egg is laid by the female in the alimentary tract of the host animal. The embryo may develop from the egg whilst it is in the bowel of the animal, or in the excreta after the latter has been passed out into the open. Dr. Sydney Dodd, D.V.Sc., F.R.C.V.S., Veterinary Pathological Laboratory, University of Sydney, says :—" The period the embryo takes to hatch out depends upon conditions of moisture and temperature, and may vary from a matter of hours up to weeks. The larva which then develops forms a protective sheath around itself, and lives upon the food material which is stored up in its own body. In this state it can survive adverse conditions, *e.g.*, dryness, cold, etc., for some months. With a warm temperature, however, the larva becomes active, and makes its way up the blades of grass, etc., where it again comes to rest. When such grass is eaten, the larva is swallowed with it, and in the animal's stomach develops and becomes an adult worm in about three weeks. The two sexes then copulate, and the female produces its eggs.

" A thing of some practical importance becomes evident from the foregoing, viz., that there is no actual multiplication of the worms in the animal's stomach, *i.e.*, the number of adult worms present in an animal represents no more than the number of larvae actually swallowed, and it therefore follows that the degree with which an animal may be infested with such parasites depends upon the facilities with which the larvae may be picked up and swallowed."

The condition produced by such worms is a chronic inflammation of the true stomach, accompanied by diarrhoea, wasting and anaemia. Young sheep suffer most severely from the effects of these stomach worms, but adult animals are frequently affected also.

This review of the life history of the stomach worm indicates three points of great practical importance :—(1) In wet seasons one must be prepared for an increase in the number of such parasites. (2) That moist places are always to be considered a harbour for the larvae of the worms. (3) That if one is trying to eradicate worms from a paddock by starving them out, *i.e.*, by removing all stock to fresh dry paddocks, the infested paddock will need to remain free from sheep or cattle for a relatively lengthy period.

Now, the first signs of the disease are an absence of yolk in the wool, and a disinclination in the sheep to travel ; also if the eyelid is lifted up and no veins show, or if the veins are very dark, worms are probably present. A good way to detect tape worm in its initial stages is to yard the sheep over-night and examine the excreta carefully in the morning. If worms are present it will be slimy, and the white minute sections of the tape worms will be seen. Another test is to open up the wool, and if the skin is found to be a dull or whitish colour, the owner had better drench at once, as described later on. The most careful preventive measures should always be taken by owners in country that is liable to worm infestation. Nearly all the harmful worm parasites require moist ground or stagnant water to live in while they are in the egg stage. Hence, a great thing is to keep the sheep on country that is free from such natural harbours. The farmer with a bit of swampy ground, therefore, should regard the fencing or draining of it as one of the jobs that there is money in, and that should be undertaken as soon as opportunity offers. Pipe-draining is not necessary, as many may imagine. An equally effective and much cheaper plan is to place two straight saplings, 8 or 9 in. thick, 3 or 4 in. apart, in the bottom of a channel cut for the purpose, and then a third sapling on top to keep the other two apart; a good covering of scrub or brushwood is put over this, and finally the channel is filled in with earth. In this way a very inexpensive and efficient drain is made that will last for years. Surface draining by running plough furrows according to the contour of the land can be done at a moderate cost, even on large areas.

On land that is at all infested with worms, the sheep should not be allowed to water at mudholes. They should be given proper troughs for the purpose. Stock always prefer clean water, and once they become familiar with troughs they will come to them to drink rather than to contaminated water. A few trials, provided they are persevered in, will prove this. Paddocks known to be infested should be spelled. Horses and cattle may be grazed thereon, but cultivation would be much more effective. Even one year's spelling is valuable, though two years is better. An occasional burning off of the pastures is also a good move, as many of the embryos are destroyed.

A writer in "The Pastoral Review" says:—"Young weaners are the most easily affected. Country full of melon holes is always wormy. If the sheep are kept on cultivated ground they will not get worms, but get daggy instead, and then have to be crutched. On this class of country, and even inland in a drought, give the sheep plenty of salt, and as much variety of feed as is possible by shifting them about. However, do not shift them, unless absolutely necessary, when about to lamb."

Another thing, established by experiment, is the value of laying down a certain area with good introduced grasses, clovers or lucerne, where the natural herbage is poor and innutritious. An experiment carried out at Glen Innes, New England, New South Wales, on country very susceptible to worms, showed that lambs fed on natural pastures from 7th January to 4th September, regularly supplied with licks, and treated with drenches, gained on the average only 28 lbs. in weight, while lambs on cultivated pastures consisting of introduced grasses, and otherwise subjected to no treatment, actually gained 62 lbs. Except for the class of the pasture, the conditions under which the sheep were running were identical, though the paddocks of introduced grasses were rather more heavily stocked. All the sheep were infested, but the worms were unable to affect the health of the sheep that had an ample supply of clean pasture. In any ordinary season it is only the half-starved animal, or one that has been weakened by privations in youth, that is seriously affected. Definite measures to get rid of worms are not easy, but a good supply of nourishing feed (mixed, in a wet season, with dry feed) will do much to prevent infestation. Of course, this and some of the other suggestions given are only practicable on comparatively small areas, but if those in regard to stagnant water, spelling of paddocks, etc., are observed, the general run of grazier for whom this advice is chiefly intended, should be largely free from parasitic troubles. Over-stocking must be avoided, for it impoverishes the sheep, and makes them more liable to attack.

Even with the above precautions, when seasons are wet and green grass is plentiful, the careful sheep-man should examine every sheep that dies or is killed, and if worms are detected, the sheep should all be given a drench. If the greater number are not in any need of treatment so much the better, but those that are treated in good time will improve rapidly, no serious loss will be experienced, and the unaffected sheep will not have been damaged in any way by the drench. Lambs are particularly susceptible to the trouble, and they should be watched and drenched early before their constitutions have been damaged. No shearing should be allowed to pass without very close scrutiny of the lambs in case this pest may be present, and if the slightest sign of worms is apparent in the lambs, drench the lot. If the season is a very wet one they may need treatment shortly after being marked, and if so they should get it. Early treatment before the sheep, and particularly lambs, show outward signs of worms is the most important consideration. As already pointed out, frequent change of paddocks is very helpful, and if the worms are firmly established, it may even be necessary to move the stock to a dry district, saltbush country for preference, to save heavy losses. Early autumn is a troublesome time with stomach worms, and they are sometimes found even in early spring, especially in lambs weakened by privation. The intestinal worm, judging from scientific post mortems, is not as a rule a serious trouble in young sheep, but the tape worm, which infests lambs at an early age, is the cause of considerable loss.

Treatment for stomach and intestinal worms consists of drenching, but for lung worm it is not efficacious. However, as sheep affected with lung worm are usually also affected with either stomach or intestinal worms, a drench will, as a rule, expel these, and the sheep being relieved of its worst enemy, naturally does better, and improves in condition. Probably the most effective drench is that having arsenic as its chief constituent. Take ½ lb. washing soda and boil in 7 quarts water; when the water starts to boil, take off the fire and put in arsenic (½ lb.) slowly. Boil slowly for half an hour, strain into another tin, and make up to 8 quarts. To use, take 1 quart arsenic water, and add 12 quarts water, and give lambs 1½-oz. dose, grown sheep 2 ozs., and lambs under six months 1 oz.

Give them another dose in about ten days' time, and if no, or little, improvement, another dose in about another ten days. Yard sheep the night before drenching, and keep off feed and water for four hours or longer after drenching. Use rain water for the mixture, and in administering allow the sheep to stand on its four legs. The head should not be forced back, nor the drenching hurried, as either is likely to cause choking and possible death.

Another recipe is :—1 oz. white arsenic, 1½ figs strong tobacco, and 2 ozs. washing soda, to be boiled in 4 gallons water. Boil for 40 minutes on good strong boil. Allow and make up for what has been lost by vapour while boiling. Yard sheep over-night and dose on empty stomach if possible, but do not let lambs be too hungry. Dose for lambs three months old, 1 fluid oz., lambs five months old, 1½ ozs.

Great care should be taken in preparing arsenic drenches that all the arsenic and soda are dissolved. The fluid should then be filtered through a cloth to remove any large particles, or the sediment allowed to settle, and only clear liquid used; also to make sure of a minimum loss, in case of a mistake in mixing, always dose a few sheep a day or so before doing the flock. The drenches given will not injure the constitution, and if properly used, are quite safe. It is as well to drench hoggets in the spring, if dealing with wormy country, and breeding ewes when tailing the lambs.

Other recipes are :—

(1) For lambs—1 lb. (avoirdupois) pure bluestone, and 1 lb. Colman's mustard (fresh); mix well with 12 gallons rain water. Dose

—for lambs 3 to 6 months old, 2 ozs. ; 6 to 9 months, 3 ozs. ; 9 to 12 months, 3½ to 4 ozs. For sheep the solution should be 1 lb. bluestone and 1 lb. mustard in 10 gallons of water, and the dose 4 ozs. The quantities of bluestone and water and the doses should be accurately weighed and measured, and the dissolving should not be done in an iron or galvanised vessel, though an enamelled bucket will answer very well.

(2) For lambs, ¼ oz., and for sheep, ½ oz. gasoline, to be given in oil, linseed, tea, or milk. The dose should be given once daily for three days. The evening before the first treatment the sheep should be shut up without food or water, and dosed about 10 a.m. next morning. Three hours later they could be allowed food and water, but should be shut up again at night, and dosed the second and third mornings as on the first.

(3) A good drench for intestinal worms is :—2 ozs. arsenic, 5 lbs. Epsom salts. Boil in one gallon of water for forty minutes. Strain and make up to 5 gallons. Give grown sheep 2 fluid ozs., 2-tooths 1½ ozs., and lambs up to twelve months old 1 fluid oz. Proper tin dosers, made to measure the correct quantity of the mixture, should be used. Drenches containing turpentine are likely to cause irritation and coughing, no matter how carefully administered.

There are some very effective worm pills and tablets on the market, and they have many points in their favour, there being little danger of choking ; they are easily carried, and they can be given in paddocks whenever a sheep is noticed to be ill. To administer a pill, don't throw the sheep, but stand over it, and using a leather thumb-stall, force open the mouth by placing the fingers in the roof and the thumb against the front teeth, and throw the pill in on the back of the tongue.

LUNG WORMS.

Lung worms are more difficult to deal with than stomach or tape worms, and require special treatment, but where sheep are affected with this species, it will usually be found that they are also infested with stomach and intestinal worms, which cause serious debility and reduce the resisting powers of the sheep, enabling the lung worm to get a good hold. If, however, sheep showing symptoms of lung worm are treated for intestinal and stomach worms, in a large number of cases they will be so improved in health as to be able to throw off the lung worm.

The chief methods of dealing with this parasite are intertracheal injection and drenching. Intertracheal injection is only suitable for very small flocks or stud sheep, and is also not without danger, and requires care and skill in administration. Make up an average dose for a grown sheep from the following prescription :—Oil of turpentine, 20 drops ; oil of creosote, 10 drops ; chloroform, 10 drops ; and olive oil, 1 drachm. For lambs, this may be decreased by one third. Inject into the trachea about half way down the neck, either with a special syringe with a curved needle, or an ordinary hypodermic syringe. It usually induces severe coughing, and needs repeating three or four times at intervals. With regard to a drench, the following can be tried :—Turpentine three parts, sulphur five parts. Mix into a paste of the consistency of porridge. Dose for sheep and lambs, ¼ oz., equal to one teaspoonful. Should be yarded 12 hours before and 4 hours after the mixture has been administered.

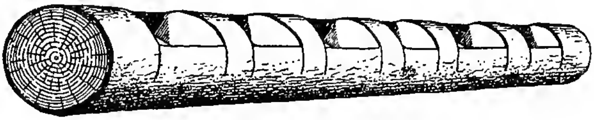
In New Zealand some sheep owners consider that growing pinus insignis is a good remedy, the young sheep being allowed to eat the lower branches and lick the exuding turpentine, although too much of it is liable to affect the kidneys. A tree can also be cut down and dragged into the mob when there is any sign of coughing. According to careful research work carried out in California, U.S.A., the use of chloroform has been proved effective, being simpler, and giving better results, than fumigation or injection of mixtures to the windpipe. It was found that injecting the chloroform directly into the nostrils in full strength numbed the worms temporarily, in which state they were coughed up—as a result of the irritation created by the drug—and swallowed. The dose was just enough to make the animal groggy, and varied with different sheep, the maximum being 3 cubic centimetres, with less for lambs. The head was tipped back and the chloroform injected by means of a pipette or medicine dropper, half the dose in each nostril. The nostrils should be closed by the hand after the injection for a few moments. Two hours later a purge of Epsom or Glauber salts should be given in warm water. The droppings should be thoroughly disinfected by liberal and frequent applications of chloride of lime.

In addition to the above remedies, there are a number of specifics on the market, which give more or less satisfactory results, but the best thing to do, if it is possible, is to get the sheep on to dry country and good feed at the earliest opportunity. Also provide them with suitable licks, such as the following :—200 lbs. salt, 1 quart Stockholm tar, and 1 quart spirits of turpentine ; or one bag of salt, 15 lbs. sulphate of iron, 15 lbs. sulphur, and 125 lbs of slacked lime. The iron should be dissolved in 2 gallons of water and the ingredients mixed together.

A change of lick is necessary from time to time such as salt alone or salt and lime, or indeed any variety of the ingredients mentioned, provided that salt is the main item. Sulphur may be left out or used more sparingly in the winter months with advantage ; but it is especially useful in the summer.

The question of giving salt to sheep has been frequently debated, but generally speaking they should have it, and as a rule they will not eat more than is good for them. Sheep on saltbush country do well, other things being favourable, and the wool is sound, well-grown and nourished. Of course, if fine salt is used, it is easy for stock to get too much, and a good idea is to leave it in bags for about a year in the open. Let it get thoroughly wet and set and it will become like rock salt. Or else it can be simply watered in the bags, although it takes a good while to set properly.

The accompanying sketch gives an idea as to how a good solid log may be turned into a salt box or rack. The cuts can best be made by means of a cross-cut saw, and the pieces taken out with the aid of a strong chisel or wedges. The size of the cups will necessarily be determined by the diameter of the log and also by the class of stock run in the paddock. In any case it is not advisable to sink the cups more than half-way through the log.



A Log used as Salt Rack.

Giddiness from Tape Worms.

Another worm ailment to which sheep are liable is a madness or giddiness caused by segments of the tape worm dropped by dogs and picked up by the sheep when feeding. Finding its way up the nostril, the parasite lodges on the brain of the sheep, where it forms a bag of water, which continually increasing in size eventually kills the animal. The symptoms are indicated by the sheep walking round in circles, nearly always turning to the left, with the head inclined in that direction, and with rolling eyes when the disease is in an acute form. The trouble is frequently cured by a comparatively simple operation. Hold the sheep firmly, and from the left horn button measure the breadth of three fingers towards the back of the neck, inclining towards the centre of the head. Clip the wool closely to the head with scissors, and insert a canula, with trocar, straight towards the nose. Draw out the trocar and a quantity of water should come out. Insert a syringe and pump the cyst dry, and if possible try to draw out the bag. However, this will not injure the sheep if left in. Draw out the canula and dose the wound with collodium. Bearing in mind that this special form of giddiness is entirely caused by the sheep picking up the tape worm dropped by dogs, it can be almost entirely prevented by administering areca nut to all the dogs about the place.

FOOTROT.

The next ailment to which we will give consideration is footrot, which, roughly speaking, may be said to be of two kinds, contagious and non-contagious. The latter, which is also known as "dew-scald," "fouls," etc., usually commences in or near the little gland or sac at the front of the foot and just between the digits, containing the lubricant that keeps the digit space from becoming hard and liable to crack. In wet seasons or on swampy or marshy country the hoofs grow rapidly through having nothing to wear them down, with the result that they become clogged with mud and herbage, which ferments and causes ulceration, and this, if left alone, spreads up under the hoof and affects the laminae of the foot. The same trouble can be created by keeping sheep in wet, filthy yards or sheds, or as already stated, on low, undrained land. True, or contagious footrot, does not necessarily arise from wet ground or wet and rotten litter, although such conditions naturally predispose the sheep to attacks, and are aggravating factors in connection with the disease. It seems to spread most rapidly during moist warm weather, and to find the earliest external symptoms, attention should be directed to the heels or back portion of the hoof, where it is split up for only a short distance, and is devoid of hair. In a healthy foot, the skin on that portion is dry and not abnormally hot, but when disease is present the skin is moist, exuding a thin, watery serum. The part appears slightly ulcerated, or rather, instead of a smooth skin in the little cleft, as in a healthy foot, the skin is of a washed macerated appearance. The sheep at this stage will not limp, but as the inflammation proceeds lameness will appear before the hoof is visibly affected, caused no doubt by the friction of the inflamed parts. Ulceration of the hoof rapidly follows under the horn, downwards to the sole of the foot. The latter is soon eaten away, and canals of purulent matter are established in various parts under the hoof, and thus we have malignant footrot in its worst form. The discharge is very offensive, emitting an effluvium that, once experienced, can never be forgotten

Of course, simple footrot is also contagious in the same sense that a septic wound or running sore may be contagious, and therefore for practical purposes, we may regard the disease as all one, and treat it, whatever form it may be in, as likely to become widespread in the flock if careful precautions are not taken immediately. Once footrot gets a good hold, it requires a great deal of care and patience to get rid of it, and unless adjoining owners are equally careful it is likely to be labour in vain. Merinos are more susceptible to the trouble than British breeds or Corriedales, and Romney Marsh are considered to be the least liable of the lot—on account of a degree of immunity acquired through long periods of depasturing on the marshes of their natural home; but even they can become quite as badly infected as Merinos. Footrotty sheep should not be allowed to go on sound country until cured, and in treating a flock a hospital paddock is necessary, so that the affected animals can be isolated.

The forefeet of the animal are usually first attacked, sometimes both of them simultaneously, but generally only one. When the disease has partly run its course in one foot, the other forefoot is likely to be attacked, and eventually the hind ones. When the foot becomes considerably disorganised it is held up by the animal. When another one reaches the same stage, the miserable sufferer seeks its food on its knees, and if compelled to walk, its hobbling shows the intense agony it endures when bringing its diseased feet in contact with the ground.

In dealing with affected sheep they should be placed over-night in a yard or shed well littered with clean straw or grass, which has previously been wetted. In the morning their hoofs will be quite soft, and the removal of the diseased portions will be easier of accomplishment. The process of paring is the most important factor in aiding the cure. It is a wearisome and unpleasant business, but absolutely necessary. The operator should be comfortably seated, and the sheep held in the fork, with the left leg of the operator between the hind legs of the sheep, resting the foot firmly on the ground. This prevents struggling. Next take a firm hold of the hind foot on one side and treat that, and then deal likewise with the other.

While the hind feet are being dressed, tuck the forelegs under the left arm, letting the arm from the shoulder to about the elbow rest slant-wise across the brisket in the way a shearer does when taking off the belly wool. This saves the operator from getting cuts, and allows him to fix his whole attention on the feet. The hind feet should always be done first, to save blood getting on to one's clothes. When the forefeet come to be done hold the patient in a less perpendicular position so as to bring the hand action well above the feet, and one leg can be left under the arm. After the whole four feet have been gone over the sheep should be handed to the dresser. The operator must neither have to catch his sheep nor let it go ; the catcher fills both offices. The reason for this is that capturing the sheep and turning it into the required position creates an unsteady hand, and a great thing in the paring of the diseased hoof is a sharp knife and a steady hand and wrist.

Three or four good sharp knives (one, at least, a thin and narrow one) and a good pair of secateurs are required. If the hoofs are large, and especially if they are dry and hard, they should be first shortened with the secateurs. In fact, if the hoof only requires paring on account of being too long, the toe-nippers will do all that is necessary, no knife being needed. All superfluous horn should be well trimmed off, special care being taken to remove the covering from any hollow places underneath the sides of the hoof, as therein may lurk germs which would lead to a fresh outbreak unless effectually destroyed. It is better, if possible, not to wound the sole so as to cause it to bleed freely, but no fear of this must prevent a full compliance with the rule above laid down. The toe vein should not be cut, for if this is injured a growth of proud flesh generally comes, necessitating extra attention before the foot can be healed.

If the disease is in the first stage, *i.e.*, if there is merely an ulceration of the flesh in the cleft above the walls of the hoof, no paring is necessary. But if the ulceration has established itself between the hoof and the fleshy sole, the ulcerated parts must be entirely denuded of their horny covering, cost what it may of time and care. If the foot is in the third stage—a mass of rottenness and filled with maggots—the maggots should be first killed with a mixture of dip or spirits of turpentine. Every particle of loose horn should then be removed, though it takes the entire hoof, and it frequently does take the entire hoof in the advanced stages of the disease. All the instruments should be sterilised after treating each sheep by dipping them in a solution of lysol or carbolic, and before putting them away, boil them well, dry thoroughly and oil them. The parings from the diseased feet should always be carefully burned, and not swept down the grating in the sheep pens.

Next comes the important question : What constitutes the best mixture for a foot bath ? It is doubtful whether anything equals a solution of sulphate of copper or bluestone, placed in the bottom of a shallow trough, say 20 to 30 ft. long, set in a gateway through which the affected animals are made to walk as soon as they have been pared. The solution should consist of 1 lb. of bluestone to 1 gallon of water, warm, though if prevention only is aimed at half this strength should suffice, and there should be just enough of it in the trough to cover the sheep's feet. Along the bottom of the trough have cross pieces or grooves, or nail strips of sheepskins, to prevent slipping, and allow the patients to stand till the trough is filled with sheep, so that the feet get thoroughly saturated. Then let them stand on a dry clean floor for several hours before turning out, after which they should be looked to as often as once in three days, in order that any bad cases can be washed and re-dressed. Copper sulphate being poisonous, care should be taken to so protect the bath as to prevent stock drinking the solution, and if ewes with lambs at foot are being treated, they should be put through very quietly to obviate any chance of the solution getting on to the teats, and thus into the mouths of the lambs. The necessity for quiet treatment also applies to sheep with long wool, otherwise the splashings may discolour it.

Some owners consider arsenic a good bath, but we believe it only temporarily allays the complaint by creating a dry crust over the sore, with the result that in a week or two the sheep are bad again. For hand-dressing a few bad cases, a good salve can be made as follows :—1½ ozs. of aqua fortis, ¼ lb. bluestone, 1 oz. Friar's balsam, one-third as much alum or salt as bluestone (alum best), and as much mutton fat or lard as is necessary to make a salve soft enough for application. Powder the bluestone and alum very fine, mix thoroughly, then add the aqua fortis. Mix until it becomes a paste, then add the Friar's balsam, and afterwards the fat. The cure greatly depends on the paring, as every part of the rot must be exposed for the salve to act upon.

ANTHRAX.

In concluding this chapter, a brief reference may be made to anthrax, a disease which though not very long ago the cause of serious loss to sheep owners in Australia, is now, thanks to the discovery of preventive vaccines no longer a terror in the land. The progress of the ailment in sheep is generally very rapid, and except to thoroughly trained observation, is imperceptible until almost immediately before death. Decomposition is also very rapid in an animal dead of anthrax, and on post-mortem examination some of the following symptoms will generally be found to be present. The blood fluid and discoloured, of a thick tarry nature, seldom congealing, as in cases of ordinary death ; the skin and tissue blood-stained ; the organs generally distended with blood, which often exudes with the animal's excretions in life, spreading the germs of the disease. Small spots of purplish or reddish colour often appear on the lungs, while between the skin and the body are frequently patches of gelatinous matter.

In the spleen, however, will be found the characteristic lesions of this disease. This organ, which in the healthy animal is small and firm, becomes, in one affected with anthrax, large, dark, and rotten, distended with blood to such an extent that, from weighing about 2 ozs. in health, it is not unusual to find it weighing from 5 to 7 ozs. in a diseased sheep, while in cattle, instead of weighing 2 to 3 lbs., it frequently weighs 8 lbs. or more.

This is so general an effect of the disease that it may be accepted as a proof that anthrax is present if the spleen is found affected as above, with some of the other appearances also showing.

The greatest care should also be exercised in handling any animal supposed to have died of anthrax, as although man is not so liable to infection as sheep or cattle, yet the disease is readily set up by contact of a sore with blood or matter from a diseased animal; many lives are annually lost from this cause. Gloves should be worn when possible in making any post-mortem examination, and afterwards disinfected; and, when this is not practicable, the hands should be well washed in a solution of carbolic acid and water immediately the work is finished.

Cure of the disease being practically out of the question, the only other course open is prevention by inoculation, and fortunately this is both practicable and—when carried out with care in the use of the vaccine—certain. There are reliable vaccines on the market, and directly there is any sign of trouble the sheep owner should take immediate steps to protect his flock by inoculation. In every case, burning the carcases of dead stock should be carried out with scrupulous care, and when this cannot be done for fear of fire, they should be covered with wood where they lie, and burned as soon as it is safe to do so. Also if it is known or suspected that blood from an animal dead of anthrax has got on to a sore on the hand or elsewhere, the wound should be instantly washed and then cauterised deeply with pure carbolic acid or caustic potash, or, if these are not available, with a hot iron, and in nine cases out of ten further consequences would be avoided. Should, however, this not be done, or inoculation have taken place without being noticed, the disease will develop as a carbuncle, surrounded by a raised border with small vesicles, with the centre slightly depressed, which develops rapidly, and may be known from common carbuncle by the latter having no raised border, the centre prominent, and being very painful, whereas the anthrax tumour is very slightly so.

If this appears, medical assistance should be instantly sought, the treatment being excision of the tumour and free and deep cautery, with the administration of such powerful medicines as quinine and carbolic acid. The latter, being a strong poison, should not be used except under medical advice. The late Mr. J. A. Gunn, of New South Wales, was really responsible for the valuable discovery of the original stock vaccine.

CHAPTER XXII.

DISEASES OF SHEEP (*continued*).

Fluke — Symptoms — Preventive Measures — Drenches — Black Disease — Symptoms—Licks—Gangrenous Septicaemia—Symptoms—Treatment—Balanitis or Sore Pizzle—Causes—Treatment—Sickness in Lambing Ewes —Ante-partum Paralysis—Impaction—Sheep's Eyes Picked by Crows—Broken Legs—Garget—Maggots in the Horn—Hoven—"Aphis" Disease.

FLUKE.

Fluke is a parasitic disease caused by the presence, in the bile ducts of the liver of the sheep, of a flat worm, known as the fluke. It is of a light brown or flesh colour, and varies when full grown from half an inch to an inch in length, and has a most complex life cycle. A liver fluke will lay about 30,000 eggs in the bile ducts of the sheep. The egg is voided by the sheep, and under favourable circumstances is hatched and becomes an embryo, which finds a home in the body of a snail, where it grows and multiplies, not in the common way of producing eggs, but by giving rise to germs within itself, and of these there may be three or four, or even more, generations within the body of the snail. At last a change occurs and a different form arises, which is destined to leave the snail in some way not clearly understood. This is called the cercaria, and is a flat oval body 1-90th of an inch in length, with a tail like a tadpole, twice its length. The cercaria swims about for a short time in shallow puddles, and attaches itself to the roots of grass, where it shakes off its tail and forms a cyst over itself, and if taken into any animal with its food, it develops into the mature fluke. If the cysts remain on the grass a few weeks the young flukes they contain die.

When sheep are attacked by the disease their eyes soon lose their brightness and become tallowy. The skin grows moist and has a dull appearance, quite different to the hue of a healthy skin, and the wool becomes loose. As the disease advances dropsy sets in, and soon after the animal dies in a state of rottenness. Prompt treatment is necessary. First remove the infested sheep to fresh green feed if possible, or good, sound, dry pasture, as the ova excreted, lacking moisture or a host, will then be unable to develop, and give the stock a liberal supply of salt.

If the country is not naturally fluky, and the trouble has arisen in sheep that have been on unsound agistment, the best plan is to isolate the sufferers, fatten them up, and get rid of them as quickly as possible, for fluky sheep will fatten well if taken in time, though nothing can be done with them once they begin to go off.

The only preventive measures of any value against fluke are those that aim at the destruction of the eggs and embryo of the parasite, the snails that act as intermediary hosts, and the cercariae that infest the sheep. Broadly speaking, preventive measures are far more effective than attempts to cure, and a great deal of good can be done by observing the following recommendations :—

Destroy carcases of sheep dead of fluke, and infested livers of slaughtered sheep. Remove infested sheep to dry pastures, and where possible, drain wet or boggy pastures, or fence off. Draining will lower the number of snails, and will safeguard the sheep from feeding over the class of country most likely to be infested. Burn off pastures where possible. This will destroy numbers of cercariae, snails and ova, but unfortunately the very places where a fire won't go are those most requiring to be cleansed.

Fluky country can be much improved by clearing, so that immediately after rain, the sun and air and wind get in and dry it up, with the help of an odd drain.

Water stock from troughs in preference to ponds and dams, and where possible, dress the pastures with lime and salt. If sheep must be placed on infected pastures, the ill effects resulting from fluke may be greatly reduced by the following precautions :—Avoid overstocking, and allow all sheep a lick of salt and sulphate of iron, in the proportion of 20 of salt to 1 of sulphate of iron. This may be improved on by adding sulphur and lime in the same proportions as the sulphate of iron, together with a little ginger and bone meal.

The following is a useful drench, though as a matter of fact it is doubtful whether drenching does very much good, apart from having a generally beneficial effect on the system, and thus enabling the sheep the more easily to pass the fluke :—One dessert-spoonful of turpentine, 1 teaspoonful powdered resin, 5 gr. calomel, 3 drachms iodine. Mix well in half a pint of warm oatmeal gruel. The doses to be given at intervals of six days, and three dosings should be sufficient.

Podophyllin has also proved to be a remedy in some cases. Boil 1 oz. of podophyllin root in 2 quarts of water and let it simmer by the fire until reduced to 1 quart. Give each sheep, on an empty stomach, two tablespoonsful ; in three days repeat the dose. Another drench that has been found to give good results, after yarding overnight, is turps and sulphur mixed to a thick paste, say one pint at a time (don't mix more, as it evaporates). Pull tongue out, and with wooden spoon put about 2 ozs. for grown sheep and 1 oz. for weaners over tongues.

"BLACK" DISEASE.

A disease that causes considerable mortality—though fortunately in Australia it is confined to comparatively limited areas—is "black disease," which in its clinical features and lesions closely resembles the ailment in sheep in Europe known as braxy. The animals affected are almost invariably in good condition, and as a rule, unless the sheep are watched closely all day, no symptoms are observed. The animal is simply found dead in the morning on the spot where the flock had camped during the night. Deaths occasionally take place during the day in various parts of the paddocks, although far fewer than during the night.

If the flock is carefully watched, the sick animals do show some signs of illness prior to death, although such signs are not marked, and may very readily be overlooked. Furthermore, even with the greatest vigilance, the period elapsing between the first discovery of symptoms and death is generally not more than a few hours, frequently less than an hour; at times it is a matter of minutes only. An affected sheep will be observed to lag behind the others in their migrations about the paddock, although until the last it will always strive to keep up with the remainder. At first this appears to be accomplished with little or no undue effort, but gradually the periods of rest become more and more prolonged, and the efforts to keep up with the flock more pronounced.

As a rule, when mixing with the other sheep the sick one makes no attempt to feed, yet even this is not constant. Some sheep have been seen grazing and a few hours later found dead. Instead of standing with the usual alert attitude when human beings are near, the affected sheep usually appears rather indifferent to its surroundings. When moving on uneven ground the animal will at times be observed to stagger a little. Finally it lies down and ceases to attempt to follow its fellows. At this stage on being approached the animal may or may not make an attempt to escape; it depends upon how far the disease has progressed. Speaking generally, it will be seen that until the final stages there is nothing to attract the attention of the casual observer except that the animal permits its fellows to get further and further away—a thing which a healthy sheep living under these conditions will seldom do. The origin of the name of the disease arises from the dark appearance of the liver of dead victims, and the dark colour assumed by the under surface of the skin soon after death.

A New South Wales grazier, who has suffered a good deal from the trouble, recommends the use all the year round of a mixture of 10 lbs. Epsom salts with 100 lbs. Liverpool salt as a lick. No rock salt is given, so the sheep are obliged to use this. Another man with experience fills up his troughs with a mixture of 10 lbs. salt, 1 lb. lime, and ¼ lb. sulphur. There is a natural lick on his property, and in the paddock where this is situated the sheep are always free from the disease. On analysis the lick gave salt, lime and sulphur in the above proportions, and a little magnesia. It does not act immediately, but he has found that about eight months after the lick is made available, the deaths cease. All bones and carcases should be burnt. Dr. Sydney Dodd, of the Veterinary Research Laboratory, Sydney University, has been conducting exhaustive investigations into the complaint, and claims absolutely to have discovered the cause of it. He is now engaged in finding means for prevention. A cure can hardly be hoped for, seeing that the affected animal is either usually found dead, or death takes place very soon after it is discovered to be ill.

GANGRENOUS SEPTICAEMIA, OR SWELLING IN RAMS.

Deaths occasionally occur in young rams from a disease known as gangrenous septicaemia. The principal features consist of a doughy painful swelling in the neighbourhood of the infected part; the swelling spreads, is often found to crackle on pressure with the fingers, and in the centre it is generally relaxed, cool and painless, but tense, hot and painful towards the edges. If the parts are opened, the connective tissue, adipose or fatty tissue, and neighbouring muscles will be found infiltrated with yellow gelatinous material and contain foetid gas bubbles. Infection takes place in consequence of contamination of wounds of the skin by earth, manure (such as sheep camps), hay dust, etc., but only when the bacilli of oedema gets into the subcutaneous connective tissue. Before the bacilli can penetrate this, it must, to a certain extent, be prepared for their reception, as, for instance, by the presence of such fluids as serum, lymph (fester or bruised blood and flesh), and the more the circulation is interrupted on the site of infection, such as by swelling or bruises, the better will these bacilli develop on it.

The treatment for infected animals is mostly surgical, and consists in making free incisions into the swollen part to admit air, the oxygen of which is the best agent for destroying the bacilli, in obtaining drainage from the affected part, and freely disinfecting the skin with a good germicide. Should the disease be suspected, prevention is the method to adopt. The rams should be yarded and their heads well disinfected with a strong solution of, say, 1 part lysol to 20 of water, paying particular attention to the bases of the horns, forehead, cheeks, and lips, and using a cotton wool pad over the eyes to prevent injury while dressing. Use a small brush to apply the disinfectant (such as a scrubbing brush, but not too hard).

If any animals are showing signs of swollen head, isolate them and treat by extra strong application of disinfectant with free incisions into the swollen parts and bleed under the eyes. Put the rams in another paddock, as no doubt their favourite camp is full of bacilli. If there is much sheep manure on the camp it would be a good plan to burn it, or if covered with barley grass, burn as soon as the grass is dry enough. It is possible there is some earth bank, log, or branches in the paddock that the rams rub their heads on, and which is a source of infection. The trouble is also known to affect lambing ewes that have been even lightly picked about the head by crows. Needless to say, any dead animal should be burnt.

Balanitis or Sore Pizzle.

A comparatively common ailment in sheep is balanitis or sore pizzle, usually occurring among wethers, though occasionally young rams are affected. It is a spontaneous affection to start with, due to the peculiar economy of the sheep, especially Merinos, eventually culminating in a purely surgical disease, and is not contagious, as is supposed by many persons. It is usually caused by faulty shearing, too much wool having been left on the pizzle at the time, thus retaining the urine, which deposits some of its solid constituents as it cools down on being passed. Now, some of this sabulous or gritty matter, as it passes over the edge of the prepuce, or duplicated fold of skin at the end of the penis, during micturition, finds its way into the sac, and becoming mixed with the sebaceous secretion (fatty lubricating matter) sets up a great amount of irritation in the preputial sac, which ends in inflammation and a great swelling. This occurs more particularly in the emasculated animal, because in such animals there is always a shrinkage of the penis, which makes it more difficult for the urine to be ejected clear of the lips of the preputial sac. There is therefore a greater dribble into the prepuce in wethers than there is in entire animals.

If the disease is allowed to run on there is a gradual increase of the sabulous deposit within the prepuce, which causes so much inflammation and swelling, that owing to pressure on the end of the penis the urine is unable to pass through the narrow opening, causing terrible pain and suffering to the animal. In very bad cases the pressure from the swelling may stop the circulation of the blood at the end of the prepuce, or in the penis itself, which organs eventually slough away. Or the pressure of urine, through being unable to pass, may be so great in the urethra as to burst it in some part further back, and so allow the urine to escape.

The best way to avoid the trouble is to keep the wool clipped round the part in all close-woolled sheep, but do not cut off the long straight hairs growing from the end of the sheath, as these serve as a means of draining the aperture. In cases that are not very bad, a cure may possibly be effected by squeezing the prepuce to remove all pus, then washing thoroughly the inside and outside of the sheath with a 2 per cent. warm solution of lysol and water, a small glass enema syringe being used. Then treat in the same way with a 2 per cent. solution of bluestone. Bring them into the yard again a few days later, squeeze out the sheath, and again treat with the lysol and bluestone solutions.

If there is no improvement worth mentioning after two or three dressings, or the case is a very bad one, surgical methods must be resorted to. Two instruments are necessary, a grooved director or probe 5 or 6 in. long and a bistoury or small curved knife, and they must be kept well sterilised. The sheep must be placed on its back, and the director must be passed in at the end of the prepuce backwards and down as far as it will go, and the bistoury must then be run down the director, with its point and back in the groove as far as possible. The point of the bistoury must then be raised by depressing the handle, and run through the skin, and the prepuce must then be slit through from top to bottom. Then with a bit of cotton wool the whole of the sabulous matter collected in the preputial sac must be wiped out, and the part dusted with powdered boracic acid, or wiped over with some mild disinfectant, such as a 5 per cent. solution of carbolic acid in oil. The wound must be left open, and an occasional antiseptic applied to it.

Several dressings may be necessary, and if the wound does not heal well, treat with a solution of bluestone, 1 lb. to 2 gallons of water. The wound will probably take about ten days to heal, and if carefully done the operation, which can also be carried out in a more crude manner with an ordinary sharp knife by slitting the sheath from the outside, should be successful in 99 per cent. of cases.

Sickness in Lambing Ewes.

Occasionally during lambing time a sickness is prevalent amongst the ewes, and the symptoms are somewhat as follows:—The sheep appear healthy, and have plenty of milk, but they desert their lambs as soon as they are born. When they get down, they cannot get up; their right sides seem to be paralysed.

Some time back the Chief Inspector of Stock in Western Australia had this form of sickness brought before him, and he diagnosed it as follows:—The sheep are evidently suffering from a lack of nutritive properties in the food supply. The change from dry conditions to young feed at this season is frequently the cause of much loss to sheep owners. Some suffer from inflammation of the bowels as the result of sudden change, whilst others, more particularly lambing ewes, develop weakness of the muscular and nervous system. When symptoms of inflammation are noticeable, a dose of castor oil, 4 to 6 ozs., with about 2 drachms of laudanum, or a little painkiller, should prove serviceable; this may be followed with spirits, say, one glass made into toddy twice daily. When weakness or paralysis only is present, whisky, as above, may be given, combined with 3 ozs. of treacle, and the animal's strength sustained by means of drenching with gruel made from oatmeal and diluted cow's milk.

Ante-partum Paralysis in Ewes.

Another ailment to which lambing ewes are liable is ante-partum paralysis. The real cause of this complaint is having the ewes too fat, which, in conjunction with the natural effects of being with young, makes them too lazy to take the exercise necessary to keep them in good health. All animals, especially sheep, which are of a restless roaming nature, cannot possibly be kept in good health without a certain amount of exercise, and therefore, if they will not take it of their own accord, they must be made to do so. A great mistake is made by most farmers in having their ewes much too fat before lambing, the idea being that unless they are in high condition they will not have enough milk for their lambs. No greater mistake can be made, as a ewe in good store condition will probably have more milk than a very fat one, and will also lamb more easily, and with little or no risk in doing so.

Impaction.

Impaction in sheep is a trouble that is always likely to occur in dry seasons when the grass has to a great extent become dried up, and when the water supply is somewhat deficient; also in seasons when the supply of fresh grass has run short, and the flock has had to be fed with a ration of hay to supplement the grass.

Drench from time to time those sheep looking very hollow and off their feed with 2 ozs. Epsom salts in mild cases, up to 4 oz. in old sheep, in half a pint of water. For stud sheep, or farmer's breeding ewes near a homestead, 2 to 4 ozs. of Epsom salts in ¼lb. of molasses. and the whole dissolved in half a pint of hot water can be tried. In some instances a second drench should be given a few days afterwards, particularly if relief is not obtained after the first dose. In this case is recommended 2 ozs. to 4 ozs. of warm castor oil, or 2 ozs. to 4 ozs. of linseed oil—but the warm castor oil for preference. This dose of oil is rather preferable to following with another dose of Epsom salts. If sheep are being fed on lucerne hay, it is advisable to dampen the fodder immediately before use; this should lessen the liability to impaction.

SHEEPS' EYES PICKED BY CROWS.

Sheep frequently contract blood poisoning and die as a result of being picked in the eye by crows. A good remedy is a pinch of dry powdered boracic put into the injured eye as soon as the animal is discovered. Or else shear the wool away from the eye and wash thoroughly with ordinary soap and very hot water—only a little off the boil. It may even be sufficient to use water only, holding the eyelids back with two fingers and pouring the hot water in a small jet from a height of about 2 feet, well into the eye, thoroughly cleansing the socket. Another suggestion is to carry a small lump of bluestone when going the rounds of the paddocks, and rub affected eyes with it. Use the lump, not powdered, bluestone.

BROKEN LEGS.

A good method of dealing with broken legs among sheep is to take from a willow tree a branch about the size of the injured limb, and strip from it the bark, which may then be placed round the limb at the locality of the break. The bark, naturally being round, will press evenly all over, and not heavily in any one particular place so as to cause a sore. Being green, it will necessarily be easier on the inflamed flesh than ordinary wood, consequently the whole may be more tightly bound with string, and will be more inclined to keep in position than with ordinary splints. It is useful to smear the splints and string which binds them with tar before letting the sheep go, as then not only will the flies be kept away, but the chance of the string coming undone will be minimised.

Bad battens about a shed and yards are a constant source of trouble in breaking sheep's legs. Perhaps a sheep, or more likely a lamb, at the head of a mob will get a leg down between two battens when entering a shed, and some hundreds of sheep will pass over the helpless form, turning and twisting it this way and that. Even if the leg does happen to come off unbroken, some injury is sure to have been done to the sheep internally. Another cause of broken legs is a fiery dog suddenly turning the head of a mob. A lamb may easily get its leg into a small narrow hole and receive a twist that will break the limb.

Garget in Ewes.

The usual symptoms of garget are a swollen, hot, and tender condition of one or both sides of the udder. The ewe is dull, does not feed well, and is stiff in her movements. Treatment must commence in protecting the patient from climatic and other influences that are aggravating the disease. Give a dose of Epsom salts, followed by carbonate of soda and tincture of aconite once or twice a day. The udder should be well bathed twice daily with warm water and wiped quite dry afterwards. The following should then be applied with gentle friction :—Laudanum, 1 oz. ; camphorated oil, 5 ozs. ; mix thoroughly. When the inflammation has subsided, ½ oz. of hartshorn may be added to the above, or the udder may be rubbed once a day with the camphorated oil and laudanum.

Garget sometimes runs to a gangrenous state, when it is commonly known as black garget, owing to the dark purple colour of the affected part of the udder. When this takes place the affected part should be freely cut into, and then well bathed with hot water, the wound being dressed with white oils.

Maggots inside a Sheep's Horn.

Maggots are sometimes found inside the horns of sheep, and are the result of eggs laid on the noses of sheep by a fly rather larger than a housefly, yellowish grey and slightly hairy. The larvae, on hatching out of these eggs, wander up the nostrils, taking about ten months to undergo different changes. In these wanderings the larvae get into the sinuses (hollows) of the face and into the horn sinuses, which communicate directly with the face, explaining the mystery of their being found in the horns. Preventive treatment consists in dressing the noses with something that sticks and smells, such as a mixture of fish oil and Stockholm tar—a rather large order for a big flock ; but in a small mob this can be done automatically by smearing the mixture on old bags with smal holes in them and putting them over rock salt, so that the sheep in order to get the salt, poke their noses through the smeared holes and dress themselves. All maggots found on slaughter should be destroyed.

Treatment.—Snuff or the fumes of burning tar shift a good many, but the best way is to bore a hole into the horn sinus at the base of the horn with an ordinary gimlet and squirt in a wineglassful of benzine one part, water four parts. The hole is plugged with tar afterwards.

HOVEN.

Sheep are liable to suffer from hoven, or become blown, on succulent feed after rain, following a dry period on pasture. In decided changes of feed all stock should be closely watched, and short spells on the new feed are at first advisable. For example, when putting sheep on to lucerne, they should be taken away after, say, 20 minutes or half an hour, watered and rested for about 30 minutes, and then returned. If an animal does become blown, place a large teaspoonful of dry mustard in its throat, followed by a little water. In very bad cases, even a tablespoonful may be given. Some people use baking soda, same quantity, with good results.

Hoven is not very common in lambs, but it may happen in the above circumstances or when the lamb is commencing to supplement its mother's milk on succulent feed, such as rape and clover, and the compartments of the stomach are adapting themselves to the new kind of food. Naturally, if the animals are blown up rather badly, removal to some bare paddock is the best course, and as a rule this is sufficient to stay any ill-effects in the lambs. Perhaps the best remedy in bad cases is to give in a little of the mother's milk an ounce of castor oil, shaken up with a dessertspoonful of gin.

"APHIS" DISEASE.

This is an ailment which is commonly supposed to be due to aphides, but according to Dr. Dodd, lecturer in veterinary pathology and bacteriology at the Sydney University, is the result of eating trefoil. The disease consists in a more or less severe inflammation of certain parts of the skin, accompanied by exudation and irritation. Frequently the affected part becomes covered with crusts or scabs of dried exudate and blood, or, on account of the animal biting or scratching the part, the skin may be removed and large superficial wounds appear. The mortality is practically nil, but the economic loss in various ways is considerable. Sheep are usually affected after shearing, mainly in the region of the back.

The ears and noses of sheep are also the seat of lesions, and as aphides are usually very prevalent at the time, the trouble is commonly ascribed to them. Dr. Dodd says that the affection is primarily a skin trouble, involving the unpigmented (uncoloured) areas, but lesions do not occur even in these parts if they are protected from the direct rays of the sun. Protection may be afforded by a thick coating of hair, by keeping susceptible animals, that is, those with unpigmented skin, in the shade, or by covering the pink skin with some dark substance, such as walnut juice, solution of permanganate of potash or logwood, or even lamp-black mixed with grease. Thus protection would also be afforded over the part covered by a brand of black oil.

The authority already quoted states that the reason why pink (unpigmented) skin is affected and coloured (artificially or naturally) skin escapes, is as follows:—A substance exists in trefoil, and also some other plants, which when eaten, acts upon the skin in such a way as to render it very sensitive to certain of the sun's rays. The actual parts sensitised are probably the nerves of the blood vessels of the skin, which regulate the flow of blood to the latter. The result is that when exposed to the direct rays of the sun the parts are unable to react in the way unsensitised skin reacts, and are thus damaged, the consequence being inflammation of the exposed unpigmented area, often accompanied by itching.

Black skin, or pink skin covered by colouring matter, *e.g.*, lamp-black or other dark branding stuffs, although probably just as much sensitised, escapes damage, because the colouring matter acts as a non-conductor to the injurious sun's rays, which are therefore unable to penetrate and damage the sensitised true skin.

CHAPTER XXIII.

STATION MANAGEMENT.

RABBIT AND DINGO DESTRUCTION.

General Care of a Property—Painting—Rabbit Destruction—Digging Out—Using a Plough—Destroy Cover—Flooding Burrows with Bore Water—Fumigation—Poison Baits—Use of Phosphorus—Laying the Baits—Strychnine—Poisoning Water—To make Strychnine or Arsenic Water—Pit Traps—Trapping with Netting Yards—Tank Traps—Destroy all Carcases—Fumigation by Motor Exhaust—Dingo Destruction—Poisoning—Trapping—Gun Traps.

Before discussing specific phases of farm or station management, a few hints may be given regarding the general care of a property. A good owner or manager should see that valuable machinery, stores, tools, wire, drays, waggons, and the whole paraphernalia for conducting the management of the property are kept under cover, and not left unprotected and uncovered in sun and rain, as only too often occurs. Harness, saddlery, etc., is also often left uncleaned until the end of its short career, or until the travelling saddler comes along to clean it and run up his heavy annual and probably unchecked account.

On this question of general management, we cannot do better than quote a successful and experienced station manager's views, which appeared in "The Pastoral Review." He says :—"If sufficient cover has not been provided the manager should do his utmost to secure authority for the necessary expenditure, but if no money is available run up a rough bough shed with the assistance of the station men, for any kind of cover will improve the life of the plant and help in the long run to keep down the cost of management.

"All plant should be kept properly painted, and the windmills now used on so many places should not be forgotten in this respect. Keep all running machinery and wheels properly oiled. I heard the complaint of a windmill not long ago when half a mile away. Abandoned camps should be examined for tools, etc., often left behind by employees when breaking camp. Cooking utensils, axes, fencing tools, and other articles of value are lying abandoned in many old camps to-day.

"Fencing wire is too often very carelessly handled, and portions or even whole coils of it are left on the lines of fencing where new work or repairs have been carried out. There is enough wire wasted every year in Australia to fence miles of country. There are many tons of it rotting on the ground at homesteads at this moment because persons in authority are too lazy or careless to store it properly. It is a pleasure to see how well sheepskins are cared for on many places, and what good prices they make when compared with the sorry-looking, scorched, shrivelled, and weevil-eaten skins, of which the stores at the seaboard are hardly ever free. All skins should be kept under cover after being treated with an arsenical solution to destroy weevils. They should not be stored up on the station waiting for next season's wool waggons, but sent in for sale as frequently as convenient.

"When shearing is over all the odds and ends of any value about the woolshed and huts should be collected and stored. Loose packs should be sewed up in packing, as they deteriorate rapidly when left lying about a wool room. Shearing plant should be oiled and covered up against the dust, and movable parts such as tubes and hand pieces stored out of harm's way. Use plenty of oil. It is dear enough these days, but anyway it is cheaper than steel, so it should be used freely on all running machinery, windmills, and other valuable station property.

"Waggons, carts, etc., should be painted every two years, or when required, as wood perishes quickly if not kept well covered. Painting is fine work for handy station men when there is 'not much doing.' The station buildings must receive like attention from time to time. Paint is very dear, but it will pay well to use it on stations when it is needed, even at the present high prices."

The same writer says:—"The best time to paint is in dry weather, as paint applied on damp timber does not sink into the broken surface of the timber properly. Three coats will give the best results with new work, or on old timber that has been neglected. For ordinary painting, however, two coats will usually suffice. White lead of best quality, and boiled linseed oil should be used, and colouring materials well mixed with the white lead will prevent chalking, which quickly spoils such a lot of good paint, especially in summer time.

"Some general rules for painting are worth remembering. Do not paint in damp weather. Before starting to paint remove all old and loose paint with a strong wire brush. For new work knots should be painted with turpentine before laying on the first coat.

The first coat for new work should be thinned well with turpentine. and this will make the best foundation for the second and third coat. Before painting, all holes or cracks should be stopped with putty.

"In painting galvanised iron, corrugated or otherwise, new iron should be painted over with solution of copper sulphate in the proportion of four ounces to a gallon of water. When quite dry, the iron should then be painted with the best metal paint procurable. If these directions are followed, the work done will last for several years without renewal.

"For shingles and gate timber, it is advisable to dip the material in thin paint to act as a first coat, to be followed by a second coat when the shingles are in position, and the gates made up."

Rabbit Destruction.

There are many other points not referred to by the writer of the foregoing, but we will refer to some of the more important of them in the following pages, dealing first with rabbit destruction, the greatest pest that Australia has to deal with. It is generally taken as fairly near the mark that five rabbits eat and destroy as much feed as one sheep, so it does not need any very abstruse mathematical calculation to show the enormous amount of national loss that rabbits are annually responsible for. Another side of the question is the mortality they cause among sheep, especially lambs, by eating the youngest and most succulent pasture and forcing the lambs to take overdoses of unwholesome feed, such as young variegated thistles, which, if the pasture is clean and good, they take very little notice of. One young thistle is enough to kill a lamb in a very short time, as at certain stages of its growth it contains prussic acid. Rabbits and stock cannot possibly be grazed together successfully. Unceasing warfare against the pest is the only thing; once they have been driven off a holding, they should never be let in again, and if a few should get in by reason of flood or fire making holes in the fences, they should be relentlessly hunted down.

Probably the most general practice in Australia for rabbit destruction is the distribution of poisoned baits. Another method extensively used is that of poisoning water. Pit and yard traps along the fence line and drives are also effective. All these, however, are only useful in that they help to keep the pest in check. It is generally recognised that the one way of dealing with the trouble really effectually is to subdivide the land into small netted areas, destroy all cover, and systematically dig out or fumigate the warrens. This is an expensive operation, but once it is thoroughly done, and provided the property is securely netted, the subsequent cost of keeping the place clear is comparatively light. It may be remarked here that trapping, that is for the market, will do little to lessen the evil. It is in the interest of trappers that rabbits should breed, and they usually do their best to forward this.

It will not pay to dig out on big country not wire-netted, and of small carrying capacity, because of the cost; but otherwise it is sure to give good permanent results, and in the long run is really by far the cheapest method. If burrows are dug out to a depth of 2 ft., it will, in nine cases out of ten, suffice.

Where it is possible use a plough, as two men with plough and team of bullocks will do more work than twenty men with shovels. The most suitable sort to use is a heavy single-furrow tank-sinker's plough, with half the mouldboard cut off to permit of the plough sinking well into the ground, and thus more effectively break up the burrows. "Yandaroo" has some very good hints on this question in "The Pastoral Review," and may well be quoted. He says :—"Should a burrow be opened up after ploughing or digging, it should then be dug out thoroughly or cross ploughed. The plough should enter the ground two or three yards outside the burrow area as shown on the surface. The more bullocks in the team the better, but twelve or fourteen will suffice for most country. Harrowing after ploughing would improve the land for future growth of feed; but whether harrowed or not, growth is always heavy on burrow areas that have been ploughed out. Where bullocks are not available, horses can be used; but the work is really too rough for them, as they get frightened, and plunge about when they sink into a burrow.

"However, I have done a lot of work with a double-furrow plough and a pair of horses, though, of course, it is not nearly so satisfactory as work done by twelve or more bullocks yoked to a heavy single-furrow plough with shortened mouldboard. After the bullocks have tramped to and fro over the burrows and the ground is thoroughly broken up by the plough, very few, if any, rabbits will remain alive in the burrow. It is always advisable in conjunction with this work to have a man with dogs hunting the surrounding area to drive the rabbits into the burrows being treated.

"After the ploughing the dog-man should frequently examine the areas treated. and if any burrows are opened up they should be cross-ploughed. If, however, the first ploughing is done effectively with bullocks, only a very small percentage of burrows will be opened. Where timber is too dense to allow of ploughing, digging must be resorted to. Men for this work must be trustworthy, otherwise they fill in without properly digging out, and burrows so treated will soon be opened up again. When digging out it is advisable to leave the burrows open for two or three days before filling them in, as they are then less likely to be opened up by stray rabbits.

" In addition to the ploughing or digging, all hollow logs or cover of any kind should be destroyed. If the country to be treated is stony, and digging or ploughing is impracticable, the best plan is to fill the burrows up with small broken stone. This class of country should be poisoned frequently, and fumigators or traps used. Work on stony country is, however, always costly, and rarely satisfactory from a permanent point of view. Where there are rocky areas which cannot be otherwise dealt with, it sometimes pays to net them off from surrounding areas, and lay poison at stated intervals until the pest is wiped out. The netting, if care fully watched, will save these rough areas from becoming re-infested.

" With regard to care of netting fences generally, they are too frequently neglected, and runs that have been cleared, often at great expense, become re-infested. Netting is always subject to damage by stock or by washaways following rain, and these fences, especially boundary fences, should be frequently examined, especially after rain. Boundary riding is more often than not done in a very cursory manner and by irresponsible persons. The work should really be attended to by absolutely reliable employees, or by members of the station staff. On smaller areas neighbours can arrange between themselves to see that their netting fences continue effective."

If the lay of the land will allow it, and the flow of water is sufficient, a cheap, effective and easy method of ridding land of rabbits is by flooding with bore water. Several gangs of men can be working according to how much water is available. Two or three together is enough. They want some mongrels of dogs, about 100 yards of netting, a mattock and post hole shovel each. They run the netting round a series of burrows, say 30 yards in diameter, temporarily put up with stakes and bellied at the bottom. If the main drain is not too far away a tributary drain can be dug from it to the burrows with the mattocks and shovels, and the water is run into the burrow. What rabbits do not come out are drowned, and the ones that escape are caught by the dogs. When finished the whole burrow is broken in with the mattocks.

Rabbit destruction by fumigation is adopted largely in some districts, and there are many brands of fumigators on the market, all more or less effective. Probably the most useful chemical for the purpose of fumigation is bisulphide of carbon. Distribution of baits by poison carts is a cheap and fairly effective method, but it is really only to be recommended on poor land that is not worth spending a lot of money on, for it does not strike at the root of the evil, the breeding grounds, as digging out and destroying cover do. The necessary poison baits can either be prepared on the station or bought ready mixed, there being several good preparations on the market. For those who prefer to make their own the following is recommended :—2 lbs. powdered arsenic, 10 lbs. pollard, 2 lbs. bran, 2 pints treacle or 5 lbs. sugar, and 1 pint of salt. Dissolve treacle or sugar and salt in gallon of water. Thoroughly mix the arsenic *dry* with pollard and bran. Add pollard and bran in small quantities to water and sugar, stirring all the time till the mass becomes a thick dough ; then knead and the preparation is ready for the machine. The salt is added as it helps to keep the baits soft in hot weather. Otherwise they dry hard, and become unattractive to rabbits.

Pollard should be mixed and used fresh, as it becomes sour in about 24 hours, and rabbits will not then touch baits made of it. They take baits best off bare ground or roads. It is of little use to lay pollard baits on ground covered with long dry grass. The best results are usually experienced after rain, and the work of laying the baits should be done as late in the day as possible, especially in hot weather. All distributing carts work on much the same principle. The poisoned material is placed in an iron box or receiver and drops in a furrow made by a ploughshare attached to the axle of the cart. In the bottom of the box or receiver, there is a screw arrangement, something after the style of a sausage machine, which cuts the dough into small lumps about the size of a bean, and these pass down a pipe to the ground.

Rabbits are especially fond of phosphorus in any form, and most of the patent poisons contain it. The best way to mix phosphorus is to place half a stick in a pickle bottle half full of water, to which should be added a tablespoonful of bisulphide of carbon. When dissolved mix in a gallon of water, to which has been added the sugar or treacle and salt as previously recommended, and mix well together. Then add the pollard and bran in small quantities until the whole becomes of the consistency of thick dough, when it is ready for use.

As a preventive against any risk from fire due to minute portions of phosphorus not being dissolved, the contents of the bottle should be strained through fine wire gauze into the water and sugar or treacle mixture. Should any of the phosphorus remaining undissolved be mixed with pollard and laid out in the form of baits, it may cause a grass fire when the bait becomes dry, but provided bisulphide of carbon is used as the solvent, there should be very little danger. Of course, there is always a risk that stock will pick up the baits, and sheep used to hand-feeding are the most likely to suffer, especially when running on country that has been more or less denuded by rabbits. However, the furrows should be made extra deep, and the pellets small. and carts are usually fitted with coverers, which can be used when required to turn a thin layer of soil over the baits. This discounts their value to a certain extent, but as a rule the rabbits, attracted by the smell of the phosphorus, unearth them.

Where a number of carts are used, the best results are obtained by working them together under the control of one man. A single cart working in a haphazard manner here and there on a property will not effect much. As poisoning causes rabbits to shift their quarters, the idea is to cover a run as quickly and systematically as possible. The trails should be cut in zig-zag fashion. Unless watched, grass may accumulate round the ploughshare to such an extent that it will not cut any trench at all, and the baits be simply dropped amongst the grass to the danger of stock. Baits should on no account be laid close to where sheep water. If the country is at all water-logged after heavy summer rains the rabbits will make for the rises. If the carts can be got to these temporarily congested spots early, great execution will probably be done.

In addition to the baits already mentioned, apples and carrots poisoned with strychnine will give good results, although, of course, they are fatal to stock and birds if picked up by them. If sheep are grazing in the paddocks under treatment, it is advisable to lay the poison late in the evening, and remove any not taken first thing in the morning.

Cut the apples and carrots into cubes about the size of the top of one's forefinger, scratch furrows, and feed the rabbits for two nights on unpoisoned baits. Then, after soaking the cubes over-night in a solution of strychnine and sugar (1 oz. of strychnine to about 10 or 12 lbs. of bait), lay the baits in the furrows. They should be cut to a size which will enable the rabbit to take a good mouthful at the one bite. He will chew it and get the poison properly into his system, with the result that he practically drops dead in his tracks. If the baits are too large, he will merely nibble at it, and the poison will not be so effective. The cubes should be well soaked, allowing the sugar and strychnine to thoroughly permeate them. Merely sprinkling them is not of much value.

Jam and strychnine can also be used, two drachms of strychnine to a 2-lb. tin of jam being the proportion, with two or three drops of oil of cumin, aniseed, or citronella added. Of jams, raspberry will probably be found to be the best, though apple or quince give good results. As it is a difficult matter to mix such a small quantity of strychnine evenly with the jam, it is advisable to mix it first with a little dry white sugar. This will give a larger bulk, and there is a better chance of it being more evenly distributed. Of course the strychnine must be reduced to a fine powder first. The lid of an ordinary round wax vesta cardboard match box makes a convenient measure for powders. It holds just two drachms.

Large numbers of rabbits can be poisoned away from watering places by using troughs along wire netting fences, carting the water required, though this method entails a good deal of work. An excavation is made close up to the netting and parallel with the fence. Ordinary sheet iron 6 ft. x 2½ or 3 ft. is suitable. The iron is rounded to shape required, and placed in excavation level with surface of ground. The ends are best stopped with black clay mud, instead of iron ends, as the rabbits prefer it, and will, if not crowded out. always water at these ends except when the troughs are quite full. Two sheets of 6-ft. iron make a suitable sized trough, and it pays to cart the black clay for the ends when necessary, as red clay does not hold water well. The troughs must be logged over with any kind of timber to protect them from sheep or large stock. A space of 6 to 9 inches is required for the rabbits to walk under to water.

On division netted fences the troughs are placed across the line under the netting, and logged over as above described to serve rabbits on both sides of fence. It is not advisable to have troughs of a greater depth than 6 to 9 inches. Even with shallow troughs rabbits die in the water. Where rabbits are numerous some distance from water the bulk of them can be poisoned in two or three days by putting down one or two troughs on the main pads leading to the feeding grounds. Four short forks are required to carry the covering. Where timber is scarce a temporary fence round troughs with netting 6 inches above the ground level would be the most suitable way of protecting them from stock. Two posts, three wires, and from 18 to 20 ft. of netting would suffice to protect a 12 ft. trough on a boundary fence. On division fences four posts and double the quantity of wire netting would be required.

Rabbits can also be poisoned at watering places with good results. The tanks are fenced, with gates at the four corners to allow stock to water during the hours of daylight. Before dark the gates are closed, and the troughs of poisoned water placed in position outside the netting. Where netting is scarce it can be carted from water to water.

If the weather is favourable, the greater number of the rabbits watering at the tank or dam being dealt with will have been poisoned in a few nights. After the gates are opened up in the morning all dead rabbits should be picked up, and carted away for burning, as the dead bodies, if left about, frighten away those coming to water, and so delay the work. Good results have been met with on unstocked country by merely netting the water off, so that the rabbits cannot get to it ; no poison is then required as the rabbits will not go elsewhere to seek water, so quickly die.

Rabbits watering on bore water drains or lakes can be successfully poisoned, although only a limited quantity of netting may be available. The netting is placed parallel with the water in extended V form, the poison troughs being placed at the apex. If the points of the V are carried well out, the rabbits will not work back to get round the ends to water. With a quarter or half a mile of netting large areas of water can thus be quickly dealt with.

Strychnine water of strength suitable for poisoning rabbits may be made as follows :—Dissolve in any strong acid (muriatic or spirits of salts), and add to each ounce of the solution 3 pints of boiling water ; stir occasionally until cool. One fluid ounce is sufficient for a gallon of water. To make arsenic water, take a drum, fill it with 3 gallons water, put in 1 lb. washing soda, then 1 lb. arsenic ; then put it on a fire and when it comes to the boil let it do so gently for at least half an hour, and stir frequently. When this is done, the arsenic should be all dissolved ; then take it off fire and add to it 2 gallons fresh water, which will give in all about 5 gallons of arsenic water. One gallon of the arsenic water is sufficient to poison 20 gallons of fresh water.

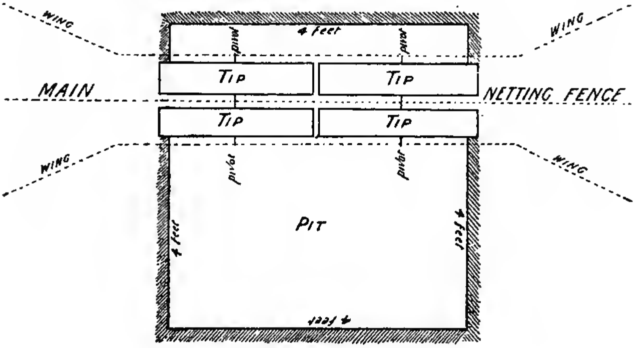
Where no stock are watering, and where netting is scarce, the following is recommended :—Have sufficient stakes 3 ft. 6 in. long to go round the water placed about 12 ft. apart, and about 1 ft. away from edge of water. Then take the wire netting, run it round and tie the top selvedge to the top end of the stakes, allowing the bottom edge of netting to lie for about 3 or 4 inches on the ground, keeping it down with earth.

Dig the poison pits along edge of netting, large enough to hold about 50 gallons water—two of these, one on each side of the tank, will be sufficient. Then securely fence the poison holes in from all danger of any stray sheep or stock getting at them and put the wire netting about 6 inches off ground to let the rabbits get in underneath.

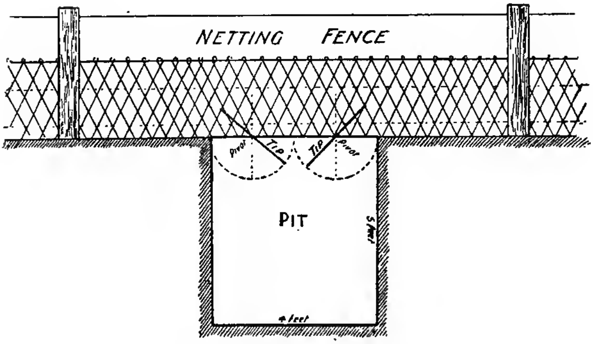
After digging the poison holes fill them up with water so that they can soak thoroughly, and if they show signs of leaking puddle them well. Water in a hole is more natural for a rabbit to water at than at a trough.

If it is inconvenient to remove stock, fence the tank in with a good strong six-wire fence on the outside of the banks, putting a gate at each corner. Then place the stakes and netting and poison pits as before. At daylight in the morning take the netting down in sufficient quantity to allow the stock on the tank full room to water, and thoroughly secure the poison pits if there is any poison water in them. Then open the gates at the corners to allow the stock in. In the evening when stock have finished watering for the day, close the gates and put netting, etc., in position, and poison the pits for another night's catch.

GROUND PLAN



VERTICAL SECTION



Pit Trap (see page 358).

A word of warning may advisedly be given here in dealing with arsenic, strychnine, etc. Very great care should be taken to mark carefully all tins used for mixing or carrying poisoned water in, and these vessels, when not further required, should be destroyed, or kept in a place away from any risk of being used for domestic purposes. Want of care in this respect has been responsible for several deaths.

An active poisoning campaign causes rabbits to seek out new country, and as they generally make for the fences, well placed pit traps will account for large numbers at any time during the summer months. The drawing on p. 357 illustrates a good type of trap. The size of the pit is immaterial, but it should be at least 3 ft. deep, and lined with timber or netting to prevent the rabbits burrowing out. The top may be covered with netting or loose slabs, and the wings are made like an ordinary fence, running out in V-shape from mouth of trap for 20 ft. or more.

To get over the difficulty of the traps becoming objectionable, which they do in hot weather if not cleaned out daily, build a netting yard close by, and connect it with the bottom of the pit by means of a pipe or tunnel. The yard need not be large, and rabbits can be prevented from returning to the pit by placing an open wire flap over the mouth of the tunnel.

For making the contrivance for balancing the tip all that is required is a piece of sheet-iron 6 inches wide, with the ends ham-

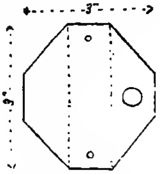


Fig. 1

Showing Construction of Bracket.

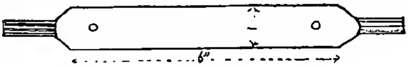


Fig. 2

Showing Construction of Tip Supports.

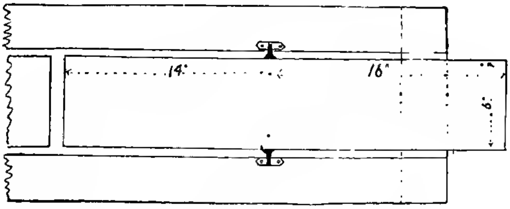


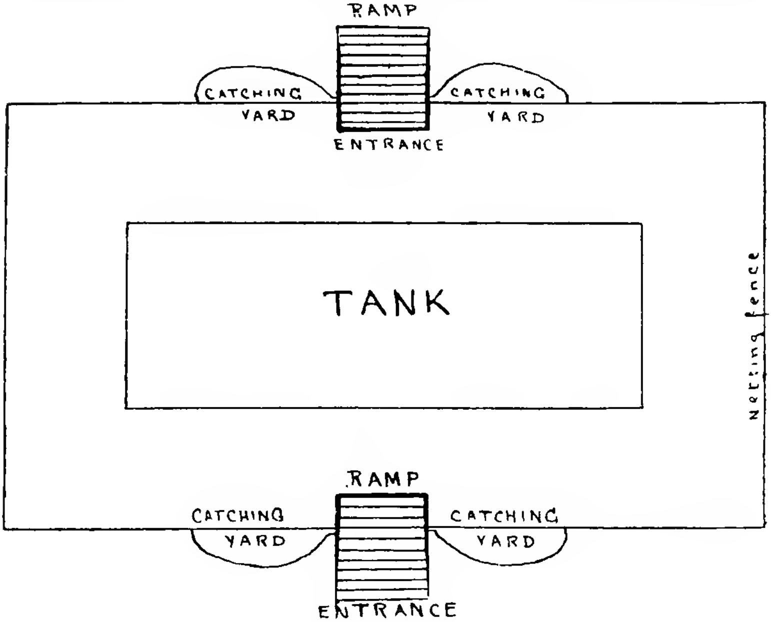
Fig. 3

A General Idea of Brackets and Tip Support in Position.

mered round to fit in the brackets on either side of the pit. It is attached underneath the tip, which is made of ¾-in. stuff 6 in. wide and 30 in. long. A frame of 3 x 3 is made to place on the mouth of the pit. The iron support is placed 16 in. from the end of the tip, so that it swings down to its place directly the weight of the rabbit has been removed from the shorter end.

Another method of trapping on fences is by means of netting yards. The netting should be sunk fully 6 inches in the ground and turned over at the top, as rabbits are liable to climb. Place entrances on the three sides other than the main fence line, making them of hollow logs some 12 inches long, to which are attached spouts or funnels at the exit end 8½ inches in diameter, narrowing down to 3½ inches. If preferred, a little hinged wire shutter may be used instead of this spout. Run wings off from the two outside corners of the yard.

Large numbers of rabbits can also be caught by means of tank traps during the dry period of the year. For a permanent trap the tank is securely netted, and openings for stock about 12 ft wide are left on one or more sides. At each entrance is arranged



TANK TRAPS.

a wooden ramp, starting from the ground level outside and rising to some 18 inches high inside the enclosure. When sheep and rabbits go to water they will walk up this ramp and jump down inside. Sheep on leaving will jump up on to the ramp again, while rabbits run underneath, the sides being open. It is here that the trap occurs, for the rodents are diverted by means of netting wings and open funnels into small netted catching yards outside the fence. It is advisable to floor these yards to prevent burrowing, and also to run an additional strip of netting round the top with an inward tilt to baulk climbers. As a more temporary arrangement, the tank, as far as stock are concerned, is for the time being entirely surrounded by netting, but small funnel openings are left by which rabbits may enter. In attempting to get out they work into the corners, where funnels or shoots are arranged opening into small catching yards. The construction of these should be the same as previously described.

It is most important that all carcases of rabbits poisoned or killed in other ways should be collected and destroyed. There is no more fertile source of blowflies and sheep maggots than dead rabbits left lying about a run.

A novel method of rabbit destruction, which really comes under the head of fumigation, and which has been found very successful, is the use of the exhaust gases of a motor car. The silencer is taken off, a light metal tube about 6 ft. long fitted over the exhaust pipe, and the requisite length of say 1-in. diameter hose attached. The other end is placed in the burrow, and the mouth of the latter closed up with earth or sand. The engine is then started running with the throttle about one fifth open. In a few seconds smoke will begin to come out of the holes; stop these up and allow the engine to run for about four minutes. A little while later the burrows can be opened up, when the inmates will either be found dead or in the last stages of collapse. It may be advisable not to close up all the holes entirely, as otherwise the gases may not extend to the extreme ends of the warren. To increase the volume of the fumes, cut a small hole in the exhaust pipe and squirt in a little crude oil.

Dingo Destruction.

Dingo or wild dog destruction is another of the trials that beset many sheep owners, and some excellent advice is given on the subject by Mr. Alex. Crawford, Chief Vermin Inspector, W.A. He says that in poisoning for dingoes one of the most important things to remember is that the hands should never be allowed to touch the baits, or if they do, the baits should be put in the fire for a few seconds to destroy the scent of the hands. The usual way is to put some strychnine in a piece of meat and drop the baits near where the dogs run. The dingo is naturally very suspicious, and will often pass such baits and not touch them, and all kinds of ways are used to try and lull his suspicions. To prepare the bait pieces of meat are cut up about 2 in. x 1 in. thick or smaller; liver is very attractive. A slit is then made, and about as much strychnine as will lie on the end of a penknife is inserted, and the meat closed up over the slit again. Care should be taken not to use too much poison, as it will make him sick and he will recover and be very difficult to poison again. The bait should not be too large or else when he chews it he may taste the strychnine and drop it. Make it about the size a dog can readily bolt without much chewing. The baits should be picked up and dropped with a fork or piece of pointed wire.

There are many ways of putting the baits down, viz., just as they are cut, or put on a piece of wire and held in a fire until the outside gets slightly cooked, wrapping them up in paper and dropping them, wrapping them in paper and tying them to a dead tree or fence a foot or two from the ground, burying them slightly underground, or putting them under the ashes of an old camp fire.

If a sheep is killed it is a good plan to make incisions all over it, and put poison in. Also phosphorus and fat makes a good bait. Dissolve some phosphorus in carbon bisulphide, melt the fat and let it cool until it can just be stirred easily. Then carefully pour in the phosphorus solution, and stir it well. The mixture is then put in an old billy or tin with a small hole in the bottom, and hung up in some place where the sun will beat on it; the fat melts and drops to the ground and dingoes will lick it up. Another useful tip is to spread some treacle with which arsenic has been mixed along a pad. The dog will then get some on his feet and naturally licks it off, thus poisoning himself.

In order to attract dingoes to where baits are laid, trails are often run. One way is to get two or three red herrings, slightly cook them over a fire, tie them to a thin rope and let them trail along the ground behind a horse, dropping baits here and there alongside the trail. Another way is to get a piece of sheepskin and put some aniseed oil or oil of rhodium on it, and drag it the same way. A sheep's head partly roasted or a pluck is often used as a drag when the other materials are not available. The main thing in dealing with dingoes on the above lines is to get a large area poisoned, and kept poisoned, with the least amount of work and expense.

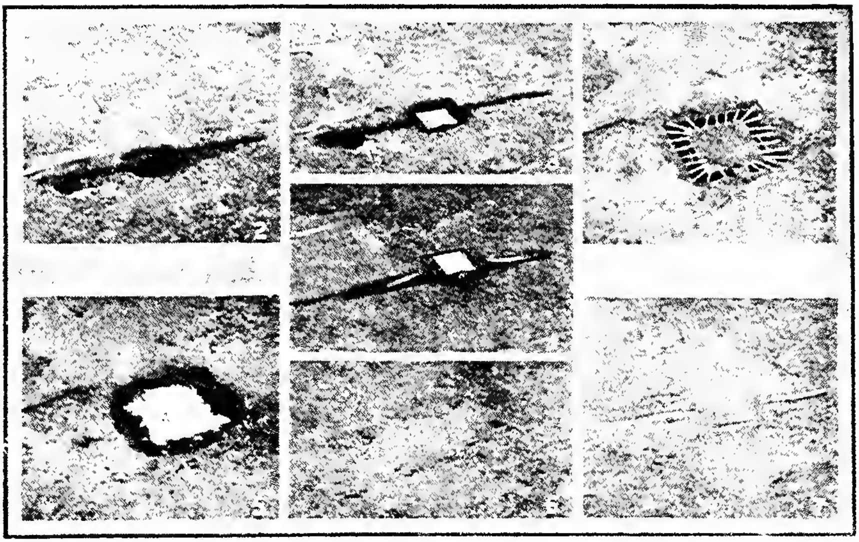
Spring traps can be used where dogs are not numerous, and the extent of country is not large. In such cases the first thing to do is to find the beat of the dingo, according to the late " Dingo" Ross, the expert in the Western Australian Government Vermin Department, and if the beat cannot be found the scratching place is the next best locality for the trap. When the dog's beat or his scratching place has been found, be very careful not to approach it too closely "otherwise he may see your tracks or smell your scent. On no account ever walk in front of the place where the trap has to be set. When you have decided on the exact spot in which to place the trap, take a bag on which to stand or kneel while working, and on it also put the soil which is taken from the hole in which you bury the trap, then take the trap and set it down at right angles to the end of the bag, having the plate exactly in the dog's track, with the heel of the trap next to the bag.

" Next, with a knife, mark the outline of the trap, which is then put to one side, and with the knife cut all round the marks you have made. Cut out the ground inside as neatly as possible, taking out the centre of where the trap is to be first, and put all loose soil on the bag. When doing this be careful not to rest your hand on the ground anywhere near the dog's track, as the first principle in dingo trapping is to allay his suspicions of danger, arising from the senses either of sight or smell indicating that the ground has been tampered with in any way. When the hole is sufficiently large and deep, set the trap, and put it carefully in the ground so that the plate will be ¼ in. below the surface, then fill in over the springs very lightly. Use a few light leaves to go round the side of the plate so as to prevent the soil from getting underneath, as this must always be kept so as to allow the plate to drop when the dog's foot goes on it.

" The next thing to be done is to put the soil carefully all round the jaws of the trap, and be careful to see that there are no small stones or bits of wood in the soil that might possibly get in the jaws near the spring, and thus keep it from closing tightly. Get a light twig that will reach across the edge of the jaws diagonally, and place it carefully underneath the plate, resting it on the opposite corners of the iaws, so as to take the weight of the soil off the plate. The twig must be very light and easily broken, so that when the dog puts its foot on the plate the twig will snap and let the plate go down ; then take some small twigs about the size of safety matches and place them from the edge of the plate to the edge of the jaws, as shown in the illustration on p. 363.

" When this is done get a piece of paper the size of the centre of the trap, making one or two tears about the centre of the paper so as to allow the air to escape. Then take some sand or earth and work it round the inside of the trap, taking care to spill none outside. Then take a small stick and work it gently in the centre of the trap so as to bring the soil on the plate on a level with the surrounding soil. Be careful to put the same kind of soil or sand on the top as is on the surrounding surface. Next take two or three twigs or sticks about $\frac{1}{4}$ in. thick and lay them along where the springs are concealed, to within about $\frac{1}{4}$ in. of the jaws of the trap

" Get a little rubbish, such as decayed vegetable matter, and place it on the end of these sticks level with the jaws; then get another twig about the size of a small penholder and place it just on the side of the trap over the catch of the tongue, so as to keep the dog from putting his foot on the tongue, and to make sure that he will put his foot on the plate of the trap, as a dog will never put his foot on a little bit of stick like this if there is a smooth place for him alongside. It is advisable to put two small sticks, one at each end of this last one that has been put down, in case it should be shifted by lizards or small animals running over it. This stick that is put down about the size of a penholder should be a little longer than the plate itself."



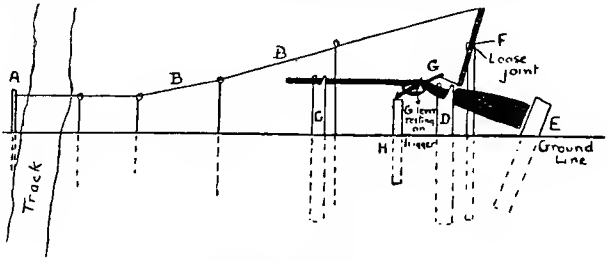
Dingo Trapping.—The Way to set a Trap.
(For key to numbers see letterpress on p. 364.)

The jaws of the trap should never be very sharp: the teeth should be either blunted or wrapped on the ends with wire so as to prevent it cutting the dog's leg off, and thus allowing him to escape. The kind of trap that Mr. Ross recommends is the 7-in. double-spring horseshoe trap, with the falling plate.

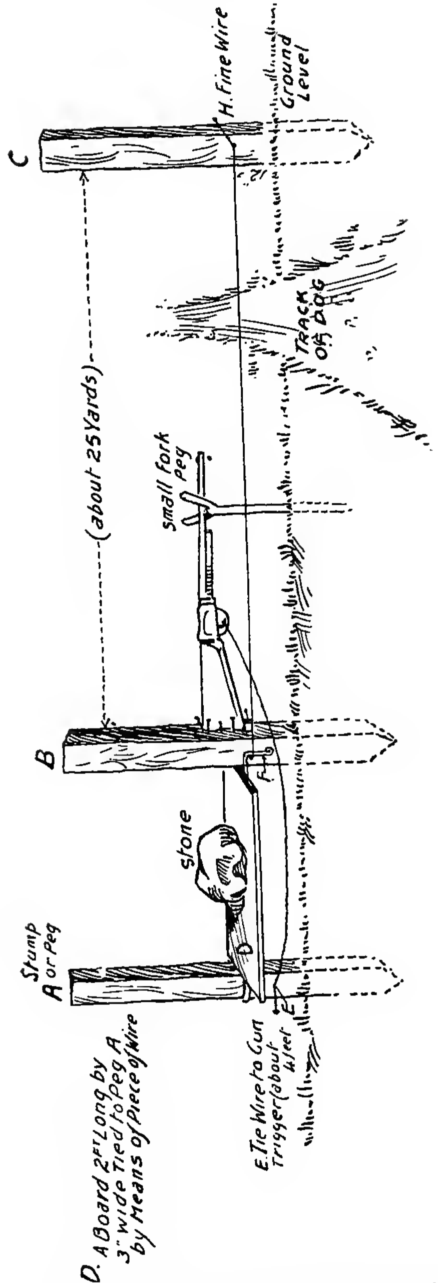
The illustrations on p. 363 show the steps from the marking out of the trap until the operation is complete. They are numbered 1 to 7, and may be briefly referred to as follows:—Fig. 1, trap laid down ready to mark out ground; fig. 2 shows the hole made to place the trap in; fig. 3, trap in position; fig. 4, pieces of thin sticks or twigs to support paper; fig. 5, paper placed over plate in order to prevent dirt from getting underneath; fig. 6, trap covered with dirt dusted over it; fig. 7, sticks laid down on finished trap.

Again taking advantage of the dingo's habit of following a track, numbers can be bagged by means of a gun trap. Having chosen a suitable site on a track known to be used by dogs, set the gun in the following manner:—First drive a peg (A) in firmly on one side of the track, leaving about a foot out of the ground; fasten a fine copper wire (B) (about 22 gauge) to this peg about 9 to 12 in. above the ground—breast high on a dog—and run the wire straight across the track and to about 15 yards beyond where the gun is to be set. Cut from one end of a 4 x 1 batten (C) a notch, into which the barrel of the gun will fit, and from another (D) one to fit the stock. Set these firmly in the ground, so that with the gun resting in them it is pointing straight along the wire to the peg. This needs careful adjusting, but once fixed, and with another peg (E) behind the stock to take the recoil, it needs little further attention.

Make another peg (F), fitted with a loose arm at one end, and set in the ground in the position shown. A small stick (G) about 18 in. long, with a nail hole bored at one end (this rests across the trigger), and a peg (H), with a nail driven into one end of it, and left protruding an inch or so, with the head of the nail cut off, makes it complete. Fasten the end of G to the lower end of the loose arm (F) with a piece of copper wire: tie the main wire (B) to the upper



Dingo Gun Trap.


H. Fine Wire
Ground Level
C
TRACK OF DOG
(about 25 Yards)
small fork peg
B
F
stone
Stump A or Peg
D
E
E. Tie Wire to Gun Trigger (about 4 feet)
D. A Board 2 ft Long by 3" wide Tied to Peg A by Means of Piece of Wire

Another Dingo Gun Trap (see p. 366).

end of F. Have a few small forked sticks to prevent any sway in the wind and keep the wire (B) in place. Adjust the tension on the wire at the upper end of F, which can be done to a nicety to suit the pull of the gun, testing it several times on the track, and when correct lift the lever (G) off the nail in H; insert a cartridge, and with a log over the barrel of the gun to keep it firm all is ready for the next dog that comes along.

The following is another method —If stumps are not available or in line drive in three pegs, A, B, and C (see p. 365). Fasten butt of gun to peg B by means of three or four wire nails and a saddle strap, so that the gun will aim about 12 in. above ground level at peg C. Make a false trigger, F, out of a piece of wood or hoop-iron about 6 in. long; nail this to peg B, so that it will pull aside or hinge; fasten to this a fine wire (about 26-gauge) from H to F (false trigger), and adjust F (under board D) so that it will keep the wire tight, then get a piece of tie wire E (say, 20-gauge) about 4 ft. long, and fasten from a nail on peg A to trigger of gun. When the dog touches the wire H, it pulls aside false trigger F, letting the board D (which is weighted by a stone or piece of timber) fall on wire E, which instantly sends the gun off. Of course it will be realised that these methods are dangerous to use on country where sheep are running, unless the gun is looked to night and morning, and left uncocked during the daytime.

A word may be said in conclusion in regard to poisoning foxes, One can use almost any sort of meat for bait—suet, caul fat, liver, young rabbit, lamb, fish, mice, opossum—but rosella parrot is as good as anything, for if foxes are passing a parrot bait they must have a bite at it, and very often swallow the parrot, feathers and all. By using parrot baits, it is always quite safe to take sheep or cattle dogs after the stock without fear of getting them poisoned, as they will not eat a parrot. When laying baits, put them close to a sheep or cattle path, or any old road through the paddock. To obviate the human scent insert a stout pointed stick into the poisoned bait and throw it well away.

Place all meat baits 1 inch under the ground, and when a bait is missed, if in hilly country, always look on the higher land above where the bait was laid, and the dead fox is mostly found. If on the plains, search along the path or road, and the fox will soon be found. Along the banks of creeks is a good place to put baits. Do not be afraid of using too much poison; if too little is used, the fox will get away and will not be found, and the skin will be lost. Put as much strychnine as will lie on a threepenny-piece in each bait. Always put baits out six weeks before the lambing starts. Keep putting some out every week up to and through the lambing season, and a few all the year round.

CHAPTER XXIV.

STATION MANAGEMENT (*continued*).

ENSILAGE, LUCERNE GROWING, ETC.

Ensilage—Cultivated Crops for Ensilage—Lucerne for Ensilage—Ensilage v. Hay—Making Pit Ensilage—Filling the Pit—Unloading the Drays—Covering the Pit—Use of Sledges—Locality of the Pit—Stack Ensilage—How much Ensilage should be given to Stock—Lucerne-growing—Making Lucerne Hay—Protecting Stacks—Protection against Mice—Bush Fires or Grass Fires—Fire Breaks—Beaters—Water Carts for Grass Fires—Burning Back to Meet a Fire—Appliance for Extinguishing Small Fires—Tree Fires.

ENSILAGE.

With the certainty, in Australia at any rate, of constantly recurring droughts, those who are in a position to do so, should, without fail, systematically in good years put by food for stock as provision against a shortage in the bad ones. One of the best and most economical forms this reserve can take is ensilage, either in pits, stacks or tubs. The relative merits of these three as means of storage are largely a matter of private judgment and local conditions, but without doubt, where large quantities are to be stored for an indefinite period, the pit is the best. Properly made, there should be little or no waste—not more than 2 per cent at the outside—and it is cheaper to store than by the tub method, and quite as cheap as the stack. With the stack system, there is necessarily a good deal of waste round the outside, where the material is exposed to the air. With tub silos there should be no waste whatever, and this is the method generally used on dairy farms and other places where the silage will be consumed during the course of the 12 months in which it is made. It hardly comes within the province of this book.

Amongst the cultivated crops which make the best ensilage may be mentioned maize, wheat, oats, barley, millet and rape. The feeding value of maize can be increased by adding some leguminous crop. Lucerne is another splendid ensilage maker. Of natural feeds, the ordinary variegated thistle is one of the best, though it is costly to handle and get into the pit. Plants such as crowfoot, burr and other trefoils, and such succulent native grasses as Queensland blue grass, Danthonia grasses, and Kangaroo grass are also good, as is also barley grass, provided it is cut early ; that is, before the heads show any sign of ripening, while the mixed growth in a dirty cultivation paddock is hard to beat. In fact, anything succulent which stock will eat in the green state will make good ensilage.

Fodder conservation by pit ensilage is better than hay, as with the latter there is always the danger of fire, and although one may insure against it, it is but a partial protection. Moreover, the hay may not be wanted for many years, by which time, with an annual insurance of 5 per cent. to pay, the cost is largely increased, in addition to which ravages by mice from below and the birds from above often render it of much less value after a few years. It is the same with maize and wheat. It cannot be kept for years, as the weevil, etc., steps in and prevents that. On the other hand, ensilage once made and well made will keep for practically an unlimited period. Moreover, no insurance is needed, and there is no danger from fire, mice, weevil, or birds.

Hay alone will not keep lambs alive. It is alright for grown sheep, but is not milk-producing, and the ewe dries off. Ensilage, on the contrary, is not only a fine food for the ewe, but is milk-producing also, and in addition, when the lamb reaches the eating stage, it feeds as heartily as its mother. It should be pointed out, however, that while it is such splendid feed, it is not in itself perfect, being deficient in protein and albuminoid constituents, so it should, if possible, be fed in conjunction with some other foods which will fill these defects, such as lucerne hay, bran, oil cake (either linseed, cotton or copra), etc.

It is difficult to say exactly how much green stuff it takes to make a ton of ensilage. Roughly one can reckon on getting three-fourths of a ton of silage from 1 ton of green fodder, but of course it depends largely on the class and state of the fodder when cut. The weight per cubic foot varies considerably, according to the depth of the silo, packing and maturity of crop. It may range from below 40 lbs. to over 50 lbs. An average will be just about 45 lbs., *i.e.*, 50 cubic feet will represent a ton.

No hard and fast rule can be laid down as to the size or dimensions of any pit ; these must necessarily be governed by the prospective yield from the crop it is intended to fill with. Generally speaking, a capacity of from 200 to 300 tons is found to be most convenient. Naturally one large pit costs less to excavate, and is less trouble than two small ones. At the same time, care must be taken not to have the pit so large that it cannot be filled properly, because to make ensilage successfully the receptacle must be filled and stacked to such a height that after the green stuff has finished settling, the top will still be above the level of the surrounding soil. In other words, there should be no depression over the pit into which water can drain. In the settling process a third or more of the original depth is lost, so it is advisable to heap the stuff nearly, or quite, as high above the ground level as it is below.

A pit 10 ft. deep should, when first filled, be topped with a mound of fodder nearly 10 ft. above the surrounding country, and one 12 ft. deep, 12 ft. high. The above being the case, it will at once be seen that another thing to avoid is making the pit too deep. About 12 ft. is the limit of convenience. However, one must not lose sight of the fact that pressure is necessary to make good ensilage, and the cheapest way to get pressure is to make the heap high.

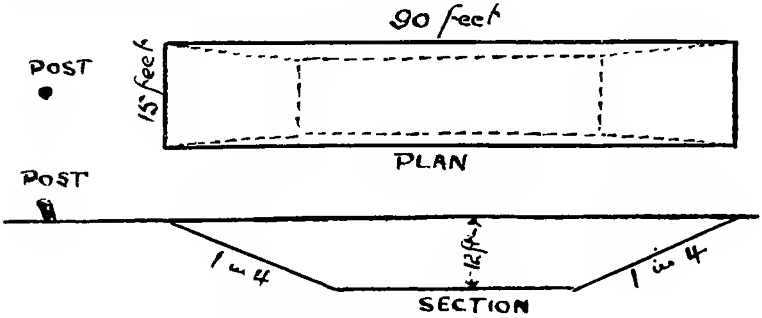
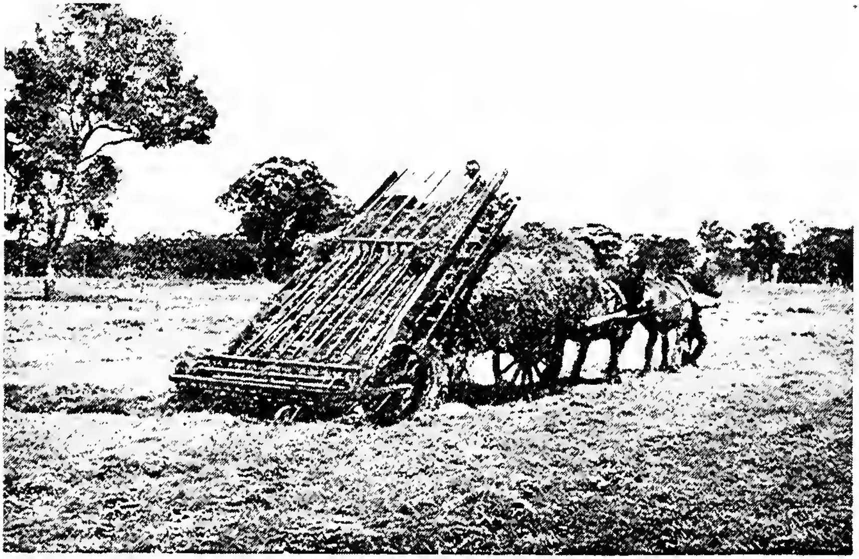


DIAGRAM OF ENSILAGE PIT.
Estimated capacity 230 tons.

As a general rule, pits take a shape somewhat resembling a "walk-in" dipping bath, *i.e.*, long, narrow and fairly deep. See diagram herewith, which illustrates a pit with an estimated capacity of 230 tons. The surface measurements are 90 ft. long, 15 ft. wide, and the depth 12 ft. The sides should be as steep as the soil will allow, and the end gradients about 1 in 4, though the latter might with advantage be made less steep.

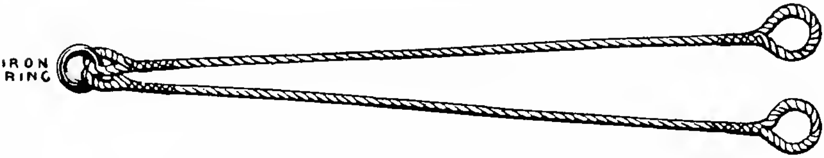
The pit, if to be filled from native pastures, should be located in the paddock to be cut, or if from a cultivated crop, as near that crop as possible. If it can be done, sink it in porous soil, for preference with a sandy bottom. Above all, avoid hollows or any natural depressions into which water may drain. If the bottom is on a clay subsoil, it is a good plan to dig a small well, say 4 ft. x 2 ft. x 3 ft., at the lowest point to drain off the juices and moisture which will exude from the green stuff under pressure. The well can be loosely covered over with a few old palings. Pit ensilage is not advisable in heavy rainfall districts. The cost of a pit excavated with a plough and earth scoop is only a small item, and the first cost is the only cost, as the same hole can be used time after time.

After cutting the crop, it is loaded on to drays either by hand, or much more cheaply, by a hay loader, an ingenious machine attached to the axle of the dray, and which in a fairly heavy crop will pile on a load in 1½ to 2 minutes without any previous raking of the stuff. The usual method of filling is to draw the dray right through the pit, and pull the load off as it travels on. This is done by means of a sling or bridle, which is laid on the cart bottom, and to which a rope is attached before the vehicle goes into the pit. A hitch is taken with this rope round a post some 20 feet from the entrance (see diagram of pit on p. 369). As the dray goes down the slope, the rope is paid out so as to just take the weight off the horse in the shafts. When the dray arrives where the load is to be dropped, the rope is made fast, and as the dray moves along the sling pulls the load off. One of these slings is illustrated on p. 371



Loading Greenstuff on to Dray with a Hay Loader.

It is made of two 16-ft lengths of stout rope, looped at both ends, and fastened at one end to an iron ring. Every succeeding load of fodder goes over what is already in the pit, the teams going in at one end and out at the other, thus giving the pressure necessary to exclude the air.



Sling for Removing Ensilage from Dray.

When the green stuff has been domed to the required height, leave it for a few days to settle, then build up again and cover the whole with earth a foot or more deep by means of the scoop, as shown in the accompanying illustration. As the earth sinks in places it wants looking at now and then to see there are no inequalities where rain water can lie and get in. Then plough, or make a ditch round the pit to carry off any water, and the

Covering Pit with Earth Scoop.

work is complete. It cannot be too strongly impressed, however, that the ensilage must not be allowed to sink below the level of the earth. If such a thing happens, it is as well to cover with sheets of iron or something suitable, and as soon as there is material enough, take the earth off and build up once again. It does not seem to matter in making ensilage if the green stuff is put into the pit wet or not.. One successful user says :—" I have frequently put it in during rain, and it is heavy with dew most mornings when put in, but it seems to make no difference." Ensilage properly made should be good for 20 years.

Some men prefer a pit of less depth than 10 or 12 ft., say 8 ft., as it is easier for the teams and less trouble to put the soil over the ensilage. A Riverina (N.S.W.) grazier, writing to " The Pastoral Review," says :—" Instead of using drays or waggons I had two sledges made with a surface of 12 x 8. I got two pieces of sawn red gum 12 ft. long, 6 in. x 4 in. I put a floor of soft wood, nailed crossways. Four horses yoked abreast easily handled the biggest load that could be put on the sledge.

" To unload the sledge I had two ropes fastened to rings at the rear, which were placed on the bottom of the sledge, and the spare ends were held by two iron standards fastened to the front. When the load was in the required position for unloading a spare horse was hooked to the loose ends of the ropes, and in two seconds the load was off.

" Before I used the sledges I used to scour the district to borrow tip drays ; it used to take six or seven to equal the two sledges. It was harder on the men pitching on to the drays, and much slower. The best crop I have grown was a mixture of skinless barley and Calcutta oats, with trefoil about a foot high. When I took out some ensilage from the pits containing the above mixture about a year afterwards it was almost as green as when it went in."

When required for use a corner of the pit is opened, and the stuff cut out with a spade, axe, or hay-cutter. If the pit is opened up in wet weather, ordinary care is necessary to see that water does not drain in. As mentioned before, with properly made pit ensilage—and it is very easy to make properly—there need be little or no waste. Provided enough earth is packed on the mound, no air can get in, and it is only air and water which will spoil ensilage.

In the case of ensilage stacks, these are built in much the same way as hayricks. They may be round or square, although the square shape is generally considered better, and is responsible for less waste than say a long narrow stack, as proportionately less surface is exposed to the air. First of all lay a foundation. This may consist of logs with the intervening space filled with broken stones or gravel, and a layer of straw on top. It need only be built up about a foot altogether, which will be sufficient to allow all moisture to drain away.

As with pit ensilage, the stuff, cut green, is carted to the storage site as quickly as possible after cutting, but the building is much more complicated than filling a pit, and it is here that the extra cost of making stack ensilage comes in. If small-stalked green stuff is used, build the stack up in the same manner as a hayrick, only more time and care must be spent in treading down and packing. A good plan is to lay a rope sling across the bottom of the dray before loading, and lift the whole lot off at the stack in one act with a derrick or jib. Another method is to build under a tree with a suitable bough, which can be used as a stationary derrick, a horse being used to supply the lifting power by means of the rope sling run through a pulley attached to the bough. When first built, the stack should be about 25 ft. high. It can then be covered with posts, etc., the weight after a while bringing the mass down to about 10 ft. The weights are then removed and the stack built up to the original height with fresh supplies. Again the weight is applied, then after a further spell removed, and a third layer placed on top.

With large-stalked stuff such as maize, it will be found necessary to take even more care. The stalks must be laid all one way, the butt end outwards. If this is done, the air will be kept out fairly well, while if they are thrown in anyhow there will be an undue amount of waste. The methods of topping up stacks vary. Some people simply put a few loads of straw on top, and throw wires, weighted with stones, over all to keep the wind from blowing it away. If, however, it is intended to keep the stack for any time, it is advisable to take more trouble. The best topping, and one which supplies weight, is 1 ft. to 18 in. of earth. This can be kept in place by putting old rails round just above the eaves to hold a row of bags of soil which in turn holds the loose earth. In dry, hot districts do not try stack ensilage unless there is no other possibility—always go for the pit.

How much ensilage should be given to stock is a question which, generally speaking, can only be answered by practical experience under varying conditions. Roughly, it may be said that sheep will keep in good condition on 3 lbs. per day (a little more for ewes with lamb) if there be just a picking of dry feed about. They will not fatten on ensilage, but will keep healthy and in good store condition.

LUCERNE.

A few words may be said here regarding lucerne, one of the richest fodders known. It does not exhaust the soil, but restores worn-out land to its original fertility. It must have plenty of moisture to get the best results, though if under water for a day or two it will die. It will not thrive on sour soil or without lime, and if absent this ingredient should be added. The best method of liming is to buy the unslacked lime, and place this in heaps about the field until it has slacked and reduced to powder. Then spread it with a shovel, and harrow it into the soil. Do not sow the land until about three weeks after this. Further applications can be put on to the land every three years with a drill. The land should have a good depth of soil, well drained and easily worked at any time during the year, and before sowing should be worked to a very fine tilth. Hard red soil is unsuitable, and so is black soil that cakes hard in dry weather.

Where irrigation is possible, the land should be thoroughly soaked a few days before sowing, and not watered again unless absolutely necessary until the plants are several inches high and have secured a good hold of the ground; also the crop should not be irrigated for at least a week before the first cutting. After hay is taken off, the land may be improved by using a scarifier, and where the crop is getting thin even light ploughing will strengthen and encourage further growth: the use of the scarifier from time to time will help to keep weeds in check. If barley grass gets ahead of lucerne it sometimes pays to turn in a flock of sheep to eat the growth right down to the roots. Manuring pays well either with well-rotted stable manure or superphosphates, from 56 to 112 lbs. of super being sufficient.

In sowing, 12 to 15 lbs. of seed is required, although many experienced growers use up to 20 lbs. to ensure fine growth, which makes the best hay. A most important consideration is pure seed, and it is well worth while to make exhaustive tests before buying. It should give at least 85 to 90 per cent. germinating power, and should be screened through a twenty mesh sieve to remove dodder and other small seeds.

If dodder, which is a parasitic growth, gets a hold, the best plan is to burn the area affected or crop the land with some other growth until the weed in question disappears. It is orange in colour, and has leafless stems with golden flowers. The best time to sow lucerne, generally speaking, is in the autumn. Climatic conditions must be carefully considered, and dry years, when the subsoil is also dry, should be avoided in starting a new crop. A good seed bed is absolutely necessary, otherwise a lot will be lost by being covered too deeply or by exposure, and bearing in mind the cost of the seed, it is highly important that the bed for it should be thoroughly cleaned and broken up, irrespective of cost.

An experienced grower says :—" The best way to properly prepare land for lucerne is to crop it for a couple of years with such crops as corn, wheat, barley, or oats. After, say, the second year's crops have been harvested the land must then be thoroughly ploughed several months before sowing. After this ploughing, the land should lie fallow, being thoroughly harrowed in the meantime, and kept well worked so as to destroy the growth of weeds. A deep ploughing is necessary for the first time, but where the fallowing has been well done, and the land reduced to a fine tilth, about five inches is sufficient for the second ploughing. Follow this by several good harrowings, and get the land as fine as possible. A light roller can now be run over the land, followed by a very light harrow, when the land is ready for sowing. Sow the seed with a drill, having some drag chains behind the drill. Remember that the working and ploughing of the land are all important

" Plough 10 inches the first time, and it is advantageous to follow with a subsoiling to a depth of 12 inches. The second ploughing must not be too deep, because this soil is what was turned up by the initial ploughing, and fallowed and worked and so brought to the requisite pitch of perfection. If the second ploughing is too deep this good soil is put out of reach of the young plants, which germinate near the surface.

" Lucerne should be cut just after the flowers come into bloom. Fine weather should be selected because good hay cannot be made if rain falls on the cut plant. Do not start mowing in the morning until the dew is off the plant. A few hours after cutting, the drier and hotter the day the shorter the time, rake the hay into rows, and leave it thus for about half a day, when it is ready to put into cocks. If dull, moist weather sets in, however, leave it in the rows for a day or two.

" The time it should be left in the cocks, and when the right amount of dryness has occurred are matters requiring some experience. If stacked too damp, it will heat and mildew, and if left too long, it becomes too dry, the leaves fall off and a great deal is wasted. It is important to keep it a good green colour, and not to leave it too long exposed. The right time to put the plant into stacks is when the stems feel crisp and dry. The stack should now be left to cure before chaffing or baling, which takes about six weeks or a little less in dry parts.

" In dry districts a reaper and binder is very useful for cutting, as the crop is kept cleaner, and the drying process is more normal. If wet weather sets in, and a cutting of hay cannot be made, excellent ensilage can be made. The best method of storing lucerne hay is to put a roof over it, with a bed of logs at the bottom. No sides are necessary. Thatching is expensive, and is apt to be blown off in thunderstorms.

" Never graze young lucerne, in fact, it is far better never to graze it at all, as it injures the crowns. Get either a drill or broadcast machine to sow the seed ; hand sowing is not advisable.

" Once the crop starts to die out, it is of no use to attempt reseeding, as it is only money thrown away. Break up the land, and sow with other crops for a couple of years before another stand of lucerne is made."

If growing for market is the objective, it will be found that it pays to bale lucerne in the paddock first rather than stack and bale later on, for even with the best cured hay a quantity of leaf falls when taken from the stack for pressing. Baling should therefore always take place as soon as the hay is dry enough. Of course, in many cases it is not found practicable to market right away from the paddock, and in that case stacking is necessary ; but even so bale in the paddock, and stack afterwards, as once the hay is properly baled it will keep for years and open up well, but if stacked for years and then baled heavy loss of leaf is a certainty.

PROTECTION OF HAY STACKS

For the protection of hay, failing a properly constructed shed with open sides and corrugated iron roof, the stack can be well protected by laying corrugated or flat iron on the hay, and about half a ton will be required for each 50 tons of hay. New iron is, very costly at the present time, but secondhand is often available.

An expert advises that in using iron on a 50-ton stack, two rows of 7 to 9 ft. iron will be required on each side of the roof, with a ridge one sheet in width along the top. A batten to fasten the iron to at each joint will be advisable with a row of three battens along each side, with one close to the eaves under the bottom sheet of iron. Iron should be fastened to battens with ordinary galvanised screws and washers, weighting the roof down close to the hay by hanging logs along each side of the stack with wires passing right over the roof.

Where only temporary covering is required tarpaulins made of well-tarred hessian will be found very suitable, and much less expensive than iron ; but it will only last from 1 to 3 years according to the weather and the skill of the person making the tarpaulin and fastening same in position. It must be very carefully weighted with logs so that by the time it is rotted away and of no further use the hay will be so well settled that little rain will enter provided the top of the stack has no hollows. If any develop they should be filled up with hay to support and keep the roof level. The best way to hold the tarpaulin in position is to run a line of 1-in. piping along the hem on each side, and hang logs to the piping. Wires passed over a tarpaulin would press it into the hay too much, and would soon cut through.

To safeguard the hay from mice each stack should be provided with tins of arsenic water. Mice can live through a summer in hay without water; but if it is provided they will drink, and by using a very weak solution of arsenic water placed in shallow tins along each side and end of stack the mice can be kept in subjection, and no damage will be done to stock by eating arsenic poisoned mice that may be cut up with the hay. Arsenicated pollard might be used with advantage during the winter months; but water is the best means of eradicating mice during the summer months. Another method is to use about $\frac{3}{4}$ lb. of sulphur to the ton of hay while stack is being built. Sprinkle rather more than this round the first few tiers, and again the same round the eaves and roof of stack, but use about $\frac{3}{4}$ lb. to ton all through the stack.

The following is another way to keep mice out of haystacks:—Fence the stack in with 6 ft. sheets of corrugated iron, about 3 ft. in the ground, and fasten them together either with small bolts or nail on to a framework erected on the side next to the stack. A coating of coal tar will give a longer life to the iron in the ground. The iron should be erected round the stack immediately on completion, or when it is about half built.

Bush Fires or Grass Fires.

Bush fires or grass fires constitute the next point to be considered in station management. Thousands of miles of fire breaks are provided every year, but in the event of a grass fire getting a fair start on a windy day, only a very wide break is likely to prove of service. Breaks of 10 to 12 ft. in width are useful to burn back from, but are of small service in the actual stopping of fires. They can only be properly made by burning a good width after ploughing four or six furrows on each side of the proposed break. A width of say, 2 chains, would, as a general rule, provide a good safe break.

Where ploughing is not feasible, burning should be done, but only at night, and during calm weather. The most valuable parts of the estate should be picked out first, and the breaks ploughed, say, every two or three miles apart, and running at right angles. Furrows running parallel with the wind are often more effective as breaks than those running across, as they do not meet the full force of the wind and fire, and prevent the face of the fire from extending.

The best break to provide would be narrow paddocks of half a mile to a mile in width, which could be heavily stocked at shearing and mustering time. These narrow paddocks should be made across the line of prevailing wind, or else two lanes, say, ¼ to ½ mile wide, could be made round a common boundary by adjoining owners, by means of a second fence, and these strips heavily stocked. The system would no doubt cost a good deal to start with, but the fencing need not be heavy—five wires and iron standards and droppers would make a good fence and cheaply erected.

Every property should have a good supply of beaters, and the most suitable are made from basils fastened on fork handles. Fire carts are indispensable, and one for every 10 to 20,000 acres would not be too many. They should be placed at convenient points, such as head and out-stations, with horses provided to run them out to fires as required. The most important consideration in dealing with fires is to get to them promptly before they get much way on.

Although there may be no wind when a fire starts, there will probably be a good breeze blowing within an hour, and a gale within three or four if the growth of burning grass is heavy. When a fire is reported the carts should be sent at once to the wind side of the fire, and starting on each side of it should work along towards the head. If the fire has only got a small start, carts could commence work at any point they reach, the main thing being to get it under control before the wind starts to blow. A good supply of beaters is essential, and a few brooms are useful for sweeping in smouldering sticks or dung which might otherwise start the fire again. A supply of food and drinking water is also necessary.

For a grass fire it is doubtful whether there is anything to beat a semi-rotary force pump, attached to a 100 or 200 gallon tank on the cart; it is astonishing how much ground a couple of hundred gallons will get over in this way. In working these extinguishing carts, the slack of the hose should be tied to the shaft or the horse's collar to keep it from getting in the way. A long steady stroke at the pump will give a more effective pressure than short jerks. For good work in all sorts of grass the jet should be broken sufficiently to make the water spread about 1 ft. in 8 or 10 ft., and be directed at a spot that distance ahead of the workers. Play the water on the grass edge rather than the fire edge, and rarely, or never, on the burning ground. The exception to this is when overtaking the last 10 or 20 yards at the head of the fire, when it is necessary to souse the fire itself and all its surroundings. The carts should be fitted with every requirement and stand ready to leave at a moment's notice for the outbreak. If horses are used they should be kept in night and day, and during the day, when risk is greatest, should stand ready harnessed, leaving only the winkers to be put on.

Fire carts are slow without beaters. With nozzle alone the operator has to wait for every vestige of smoke to disappear before moving on, while with a couple of beaters behind him he can get along at a fair walk. With ten or more good men behind him, he can go at a fast walk, simply dousing the flame and leaving the smouldering grass to be extinguished by the following beaters, comparatively easy work, as there are no hot flames to face. There are a number of excellent water or fire carts on the market, but as they are patented and widely advertised, it is not necessary to describe them. With regard to beaters, those made of light leather are of little use. Heavy beaters can be kept in good condition if occasionally dressed with neatsfoot oil, but care must be exercised not to make them too soft. In addition to the horse-drawn water-cart and beaters, it is advisable to have at least one man, with a small spray-pump apparatus on his back to attend the fences. The reservoir need only hold 4 or 5 gallons.

Burning back to meet a fire is an effective method of stopping a conflagration. The grass is fired along a line towards which the fire is making, on the windward edge of a break if there happens to be one in the line and allowed to burn back against the wind. If this is done in time a break sufficiently wide to stop a large fire can be formed. Every yard along the sides of railway lines should be fired in dry country, and around every homestead there should be a good wide fire belt. The burning or clearing of a few yards of grass close to fences will also often save many miles of that costly station improvement, and while on this point it may be mentioned that it has often been found that in cases where fencing wire has been stapled to the posts, the latter have not burned to anything like the same extent as those which have been bored.

A simple and effective appliance for extinguishing small fires can be made by fitting an ordinary oil drum on runners and attaching bagging. The drum is perforated with minute holes, and wrapped round with the bagging, which is saturated by the water oozing out through the holes. It is pushed along the edge of the fire by one man, while a second follows with a beater and finishes off the smouldering remains.

Tree fires are more difficult propositions than grass fires, and require different tactics. Good axemen are the chief essential, and all trees alight, or liable if they became ignited to fall outwards, must be felled and at once dragged on to the already burnt ground, and far enough in to prevent a whirlwind from blowing the hot coals on to unburned land. If it is all dead timber the fire cart can follow the axemen, and hose out any slight ignition, but if it is too well alight, the tree should be felled, because it takes too much time and water to effectively deal with it. If the fire is in green and dead timber it is always a good plan to look for an all-green patch and direct the fire towards that part and fight it hard there. Again, green timber is much more quickly felled and a gap can be made sufficiently wide to give breathing time. If there are any roads or tracks about they should be gone over carefully, and all dead bark or anything that would burn removed, and when that is done direct the fire towards it. At a space like this there is often a calm, as trees draw the wind more or less.

Summarising this section on fires, it may be said :—

1. The grass fire extinguisher—that is, a tank on wheels, with a force pump and hose attachment—is the best means of coping with fire.

2. Fire breaks should be more used.

3. The careless use of wax matches is probably the most common cause of bush fires.

4. Every land holder in dry country should always be prepared for fire outbreaks.

5. Preparation, equipment and organisation will save much disaster.

CHAPTER XXV.

STATION MANAGEMENT (*continued*).

TREATMENT OF PASTURES, ETC.

General Notes on Indigenous Pasture Plants—Poisonous Plants—Darling Pea—Flat Milk Weed—Variegated Thistle—Wild Melon—Wild Tobacco—Trefoil—Spelling Pastures—Ideal Natural Pasture—Improving Native Pastures—Over-stocking—Allowing Grass to Seed—Advantages of Subdivision—Herbage—Getting Grass on Bare Patches—Artificial Grasses—Slaughtering Sheep — Skinning — Dressing — Drying Skins—Preserving Light Skins.

No sheep raiser can expect to get the best results from his property unless he has some knowledge regarding the care and management of indigenous pasture plants. In Australia, taken as a whole, there are very few bad ones, and the good ones will fatten and grow stock as well as any imported article, though naturally they require proper treatment. There are plants for every season of the year in the warmer parts where the climate is adapted for sheep. Rains in sufficient quantities from January to March give us all the rich summer grasses and herbs, such as kangaroo grass, mitchell grass, blue grass, oat grass, etc. Corkscrew, which appears at this time, is one that requires careful watching, as when the seed is being shed it penetrates the skin of the sheep as described in a previous chapter, and causes heavy losses at times. In its younger stages, it is a good grass, and comes away very rapidly. It is not a fattener alone, but with the other pasture plants that grow when there is sufficient moisture and heat, it makes a good fattening mixture.

The autumn plants include Umbrella, Star, Wild Prairie, Crowfoot, Cranebill, Wild Spinach, etc., etc. Umbrella grass is a fence jumper, being wheeled along on a windy day and lifted over any fence that is in the way. Among the autumn and winter grasses, Barley grass is a good fattener, though it is not always popular in the late spring on account of the seed. It is very shallow-rooted, and a few points of rain will germinate the seed. If conditions are at all favourable there is a good bite for sheep in three weeks, and it comes just when it is most wanted, viz., at lambing time, usually lasting all through the winter. Frosts do not affect it. Most of the autumn, winter and spring plants are shallow-rooted, and most of the summer ones deep-rooted.

Generally deaths caused by poison plants are heaviest in travelling stock, because if long on the road in hard times they get so hungry that they will try to eat anything that they are capable of getting in their mouths. The reason noxious weeds do not affect stock so much in paddocks or on roads where the usual diet of herbage and grass is sufficiently plentiful to satisfy the cravings of hunger, is that guided by instinct they very occasionally touch them, and then only in small quantities.

In droughty times sheep will eat anything under the stimulus of hunger, which dulls their sense of discrimination. The only plant that is palatable to stock at all times is the Darling pea. They eat a little at first, some perhaps by accident being mixed in with other feed. It creates a craving, and the result that its narcotic effect has is that confirmed " pea-eaters" will touch nothing else but " pea," and it so affects their brain or nervous system that eventually they will not eat at all, and, if not rescued in time, death by absolute starvation ensues.

The lobelia and flat milk weed cause death by hoven very rapidly. Stock eat the latter very greedily when they drop on it around waterholes that have just dried up in summer. Death is not the effect of a poison, but of too rapid fermentation. The plants are very juicy, especially at the flowering stage, and starving stock will bite up bits of earth in order to get at them. The practical way to prevent loss is to keep the animal or animals from getting water for at least a couple of hours, and constantly move them about. This helps on the digestion, but it is a very difficult task if one happens to be close to water or the wind is blowing off water.

The variegated thistle is bad at times, at one part of its growth, just before it gets into the cabbage stage, especially if a frost has wilted the leaves a little. It is very deadly at this stage; also if the soil is at all loose or friable, stock will pull up the plants by the roots, which are full of prussic acid, a fatal poison.

The wild melon vine, though responsible for many deaths in stock, chiefly horses and a few sheep, is not poisonous. Sheep in dry times do fairly well on the fruit, but they do not eat the vine. Horses, again, eat the vine, which is disastrous. It impacts in balls as large as a mangel-wurzel, and as hard as a cricket ball. Sheep get the staggers from over-indulgence at times, so around sheepyards melons should be kept cut. If this is done when they are in flower, about 2 in. under the surface of the ground, they rarely grow again. If cut level with the surface they spring again. Wild tobacco is another plant that causes loss at times, but it is not readily eaten except in hard seasons. It has a narcotic effect, especially if its yellow flowers are eaten.

Over-stocking promotes the growth of deleterious weeds, which when dry periods come round are the only feed left for stock, and the consequence is loss of a serious nature. Stock, as a rule, do not eat these plants from choice, excepting some of the Swainsonias, which appear to create a craving for that kind of food.

Trefoil is as bad as any of the supposed poisonous weeds if eaten ravenously, especially if the dew is upon it in the early spring, and the plant is in the flowering stage, when stock blow very quickly on it. Once the fruit begins to form and ripen, it has no bad effect, because most of the sap has left it. Sorrel or young green oats will harm stock very quickly if they are hungry when first turned on, especially in the early morning.

The losses of stock from plant poisoning are very light in a normal year, hardly worth noting, but in semi-droughty periods they levy a heavy toll, especially on travelling stock that are continually in a starving condition from the constant driving—for stock routes are the home of weeds. When a land owner notices a new plant, it is advisable to cut it up thoroughly and take no chances.

With regard to the general care and treatment of pastures a grazier of long experience says:—" All holdings should be so divided and the paddocks so arranged that a proportion of the pasture can be under fallow at the plant-growing periods. In timbered lands the winter rest is the best, in my opinion, and on plains the latter end of spring and beginning of summer, so as to give the spring herbage a chance to seed. In the timber land the barley grass and trefoil are very watery in winter, and their chief fattening time is at the end of the spring. Stock will fatten on trefoil burr seed by licking it off the ground. It is not a good wool producer on account of the seed pod, which sticks like glue to the wool and mats it, but for making prime frozen lambs it's all right. The seed adheres to the wool more tenaciously when it is half green; once it drops to the ground it only badly affects the belly and breech wool. To get all the good there is out of our native plants the land requires resting quite as much as it does in successful crop raising."

There is little doubt that the fattening quality of much indigenous herbage varies according to the season. In years of moderate rainfall stock fatten more quickly and better than in seasons when the growth is abnormal and extremely rapid, for if the feed were as nutritious as it looks the stock should be rolling fat, whereas many will be found to be only stores, and making no progress. If sheep are turned into a paddock of such growth, and left alone, they will probably nibble around the edge or places where the feed is less luxuriant, indicating that their preference is for the shorter growth. Barley grass is an excellent fattener, both before and after seeding, in normal years, but in over-good seasons, after the first three months of its growth, such is not the case. Probably the unnatural growth disturbs the chemical constituents in rank pasture, and, moreover, there is a greater liability in very wet seasons to infestation by parasites, such as worms, etc. It really stands to reason that feed that has outgrown its strength, as with human beings, is likely to be weak and washy. Seeds are also, of course, more troublesome to sheep when the feed is high.

The ideal natural sheep pasture is when it is about 4 in. high, with spaces between the plants showing the bare soil, so that the feet are brought constantly in touch with the earth, thus keeping the hoofs worn down, and preventing footrot and other allied ailments. This kind of country is always good fattening but light carrying, although, on the whole, better than ground that is too closely carpeted with herbage. The feet in this case are in contact with hot decaying vegetation, which opens the gate for debilitating diseases to attack the sheep grazing thereon ; moreover, the plants are not so good in flesh and fat forming constituents, are more fibrous and less digestible. The sheep get less exercise, and become indolent ; activity is half the secret of thriftiness.

In regard to the best methods of improving native pastures the following may be recommended:—(1) Enclose, cultivate and sow with the desired grasses small proportions at the heads of valleys ; then, when in full seed, stock up and the seed will be washed to lower lands by rains following ; (2) introduce seed by stock at regular intervals from good grassed country ; (3) mix suitable grass seeds with pollard when poisoning for rabbits ; (4) in rough grass country, ring-bark the timber, burn off coarse grasses and keep eaten down with large stock from good grassed country for two or three seasons ; (5) extermination of rabbits, and light stocking with sheep. With the innutritious, and even injurious grasses, such as wire, spear, etc., if they are only growing in clumps in small proportion to the better grasses in a paddock, pull, hoe or burn them out, but if the paddock is crowded with them, it will probably pay to burn off the whole lot and lay down better varieties. Once good grasses are established, careful nursing and stocking will eventually kill out the inferior ones.

The chief difficulty in propagating native grasses is getting the seed, and another is judging the seasons properly. Time, labour, and expense are required to obtain good native pastures, but the difficulties are surmountable, and the results will certainly repay the trouble.

The method of sowing native grass seeds in small areas, such as the heads of valleys, is a good one. The areas could be increased each year, and the seed would in natural course be washed to lower levels and there germinated under favourable conditions. It is inadvisable to rely too much on stock distributing the seed, but more advisable to allow the grass to reseed itself. At first sight it appears to be false economy to allow grass to go to seed and not be utilised, but when the increase in the carrying capacity of the land is remembered, the wisdom of the method must be admitted.

Heavy stocking with sheep is to be condemned, for the crown being eaten out, the roots are exposed to the sun and soon destroyed. Also, as pointed out in an early chapter, pasture becomes " sick" and worn out as a result of over-stocking. It must be periodically rested, or the carrying capacity gradually becomes weaker, and the frame and constitution of the animals are gradually reduced. Ailments in stock rarely occur on well-managed pastures, but there are plenty, especially of a parasitic nature, on starved plant life. An occasional light harrowing after the plants have seeded has a wonderful reviving effect in renovating pastures, especially where over-stocking has been in vogue. This operation loosens the soil that has become tight round the plants as a result of stock constantly trampling about them, gives any rain that falls a better chance to get down to the roots, and also forms a covering for the seeds.

With grasses, a good system to follow, after land is well rested, is to feed off with cattle, then give a few weeks' rest, and feed off with sheep. Every paddock should be allowed to seed once a year by either wholly resting or very light stocking while the plant is dropping its seed, which usually takes about a fortnight; this system cannot be carried out over the entire run in one year, but one or two paddocks can be done at a time, and this is where a well subdivided holding has an advantage.

Regarding herbage, a contributor to " The Pastoral Review" writes :—" These plants, such as trefoil, wild carrot, wild geranium or crowfoot, cranebill and barley grass, have to be eaten off in their season, because their life cycle is so much shorter. They come and go in about four months out of every year, and if not made full use of at the time, are lost as feed, while their fruit, being prickly, adheres to the wool of sheep, deteriorating its value, and with barley grass gets into the eyes and causes blindness. They are a provision of nature, taking the place of grasses that do not make any feeding growth in the season of the year when the above herbs grow.

"Being prolific growers and seeders, over-stocking does not deteriorate the next season's growth, provided the climatic conditions are favourable. Towards autumn harrows run over the land will promote in many ways a better germination of seed, and earlier, if there is any moisture, it percolates deeper and covers the seed that is deposited on the surface. Being shallow-rooted plants, they thrive on little moisture, and so long as the top mulch is moist for a couple of inches or so, they will grow and make good feed when otherwise there would be none. Moreover, coming early, they provide a most succulent food for sheep at a period when it is most necessary, viz., lambing time, and are very fattening in their withered state, especially the trefoil."

One of the legacies frequently left by drought are patches from which both grass seed and soil have been swept away, leaving them as bare as a road. Where only the grass is gone, it is, of course, merely a matter of getting enough rain to remedy the evil, but where the top soil is gone and nothing but hard and barren subsoil remains, the injury is more serious. To get grass back on to these bare patches by artificial means is a difficult matter with large areas, but on a small piece of land, it will pay to disc-harrow and sow with say, barley grass in early autumn, which should provide feed for five months. The discing and growth also give other plant seeds, such as wild carrot and crowfoot, a chance to find a lodgment, and they again help to give the warmer season grasses a chance. Another plan is to cover the bare patches with bushes or trees, and the dust that is blowing becomes caught and accumulated, so that it replaces the soil which has been lost.

If a man, being suitably circumstanced as to conditions of climate, country, etc., decides to put in artificial grass, he must make up his mind for a large outlay of capital, as it cannot be done to the greatest advantage cheaply. If grass is sown carelessly, the main point kept in view being cheapness, the result is generally failure. No land should be put down permanently in artificial grass until the land has been thoroughly sweetened and cleaned by cultivation, for if rubbish comes up with the grass, the latter very soon has to take a "back-seat."

Different grasses require different methods in preparing the land and sowing. With the exception of prairie grass, which has a large seed, and has a very strong growth, no grass will stand the same method of sowing as is in practice in putting in oats and wheat, for the reason that the seed being so small and the plant not being so vigorous, a very much finer tilth is required; indeed, it can be taken as an axiom that ground cannot be broken up too fine for the cultivation of grasses.

It should be remembered by intending growers of artificial grasses that the same grass will give quite different results in different soils and climates. Cocksfoot is more valuable in a damp climate than in a dry one. Prairie grass will grow on flooded land, but lucerne will not. Lucerne will not grow to perfection unless there is a large amount of lime in the soil. Rye grass will grow on damp, salty ground, but on wind-swept plains does not give anything like the feeding value that a very thin crop of lucerne would. Strawberry clover will grow in water, but requires rich land; it is good summer and winter. Paspalum dilatatum will grow in very wet land, and will also grow well in very poor soil quite deficient in lime.

So it goes on, and any grazier who wants to grow a large area of artificial grass must make a study of the whole question, and find out for himself by experiment what grass or grasses suit his particular soil and climate. Otherwise he may sow a large area down to a grass that is only good in the summer or winter, and is worthless five months in the year, instead of having successional grasses that will give him feed all the year round, for it will be found that every grass has its particular season. Of course, this does not apply where irrigation is possible, as water will give a good crop of green rye grass in midsummer.

Slaughtering, Dressing and Skinning Sheep.

There are numerous other points of station management, and a few brief hints on some of them may be given. The slaughtering, dressing and skinning of sheep, for example, is a job that needs to be done properly, and as skins are almost invariably bought by weight, it is to the advantage of the vendor to get every possible scrap off the carcase. To keep the fleece clean let the killing be done on a draining board or some other clean place, care being taken to prevent blood from getting on to the neck wool. To get a first-class pelt it is necessary that the animal should be skinned while still warm. If this is not done blood will coagulate in the veins, and in a measure stain the skin. Cut pelts are damaged and lessened in value, therefore care in skinning pays. The hand may be used more than the knife in stripping a carcase.

Having caught the sheep, throw it on the near side, stick and break the neck by pulling back the head across the knee, and leave until thoroughly bled. When this is finished the sheep is pulled back into position under the dressing hook and placed on its back. Start on the near front leg (when sheep is lying on back), and make an incision with the knife just below the knee ; then cut the skin up to the hoof and down to the point of the jaw, then skin the shank. Open the other leg in the same way, cutting down to the point of the brisket ; skin the cheeks and cut out the tongue. Next work well back, clearing the brisket, which possibly in some sheep will have to be helped with the knife. At this point open up the neck, pull out the weasand, and tie to prevent paunch emptying when the carcase is hung up. Then punch down to the pizzle to clear the skin from the carcase, and also cut off the head.

Next commence on the off hind leg by opening up the skin with an incision of the knife. Cut back to the hoof, and forward right down to the tail. With the handle of the knife separate the skin from the leg (this is called handling up), then follow on with the other hind leg in a similar manner. The sheep is now ready to hang on the hook by gambrel in the ordinary way.

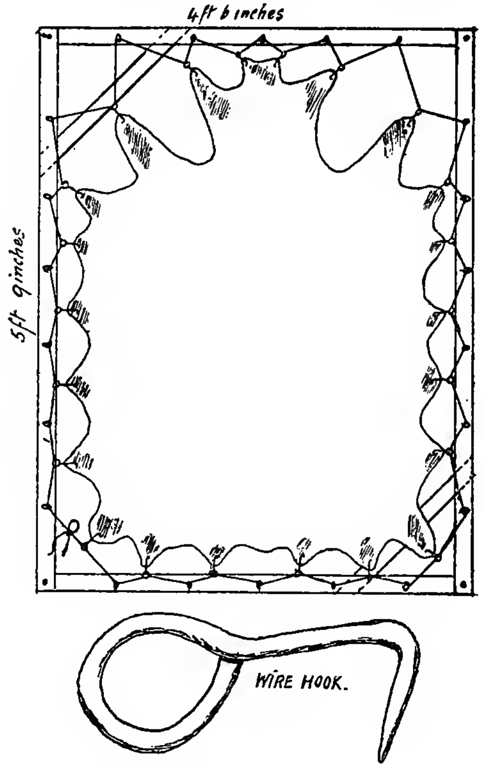
The operator should stand with the belly of the sheep toward him, and open the skin right down from the cod to point of brisket. In flanking out a sheep after clearing the cod (or udder in ewes) the skin can be thumbed up, but to do this they must be good dressing sheep. It can always be done in the case of lambs, provided they are not affected with grass seeds. Thumbing prevents scoring the skins with the knife.

When the skin is fully thumbed up it is clear to the flank, and the sheep can be turned on the hook with the back facing the operator. He then clears the tail (cutting round the vent at this stage will enable him to remove the paunch after opening up the sheep), punches one side clear, and when doing so forces the fist right down past the shoulder and outwards. This gives a good appearance to the shoulder. By half turning the sheep on the hook he has the other side ready to pull off. Should the carcase break when pulling down ease the skin with the knife.

The skinned carcase is now hanging on the hook with the back towards the butcher. Turn the sheep, insert point of knife just below the cod, and cut down to the point of the brisket, following the course of the knife with a finger on each side to prevent cutting the paunch, which naturally falls forward. Follow this cut evenly over the brisket to guide in splitting. The paunch, guts, and caul fat are pulled out by hand, the gut having already been cleared at the vent, and tied at the neck. The brisket is now split down with a knife, and a cut on each side of the diaphragm allows the pluck to be pulled out and cut clear of the neck with the knife. The carcase should now be washed and wiped up, and is complete with long shank.

TREATMENT OF SKINS.

The skins should be hung up to dry in the shade and protected from the weather, and an open shed especially designed for this purpose can easily be constructed. It should simply contain a rack consisting of two rows of upright posts about 6 feet high, to which two sets of rails are fixed in parallel lines. The measurements will be to suit the average size of skins on the station, say approximately, between roof and top rails, 1 ft.; between top and bottom rails, 2 ft. 6 in.: bottom rail to ground, 2 ft. 6 in. The skins are



FRAME FOR DRYING SHEEP SKINS.

fastened to the rails, tail end up, with nails or wire pegs. There are also a number of simple wooden frames on which skins may be dried to advantage. These frames can be fitted with pegs, over which the pelt is slipped, or else it can be fastened by means of hooks and a thin rope or sash line, as shown in the sketch on p. 389.

Frame drying does not necessarily means stretching. No effort should be made to make a skin appear larger than it really is. It should fit the frame or rack when green without any strain. When partially dry a pelt may commence to bag in the centre, but it is not necessary to tighten it up. As the drying process continues the sag will probably disappear. The points of skins should be well opened up, otherwise the advantage gained by skinning shanks, etc., is lost, as maggots get in and destroy the pieces.

Before the skin is quite dry, apply an anti-weevil mixture over the whole surface. A good wash for this purpose can be made as follows :—Put 8 gallons of water into a copper with 10 lbs. of soda ash, ½ lb. of Barbadoes aloes ; stir thoroughly until boiling ; then add 15 lbs. of arsenic. To prevent boiling over it is advisable to have a bucket of cold water handy to pour into the copper. One part of the mixture to five of water is about the right proportion for painting, but as it is poisonous, great care must be taken. It cannot be too strongly emphasised that in painting every particle of the pelt must be touched

It is unwise to attempt to stack the skins before they are thoroughly dry. Damp skins get mildewed, green, and sometimes rotten ; and even if they do not, the fact of their being packed damp will decrease their value. In packing skins for the market and export, instead of putting them in woolpacks, use three bands of hoops to fasten them up with, placing three battens (3 ft. x 1 in.) longways on top and three on the bottom to keep them flat. To save freight, fairly light wood may be used. Skins should be packed dry and flat in pairs, pelt to pelt, with the bellies slightly folded in to keep the package as square as possible. Ears and dags should be carefully removed before packing, for if the ears are left on and folded in, they often, owing to heating, damage the pelt.

The advantage in packing the skins flat is that the most valuable portion, viz., the middle, is not injured in the handling. When skins are folded in the middle they are often torn by the hooks, and this, of course, lessens their value, whereas, if packed flat, even if they are slightly torn at the edges, no great harm is done. When the wool is on the outer side, the pelt is protected from injury, and no harm arises to the portions of the wool exposed.

To preserve light skins, such as goat, sheep, kangaroo, wallaby, opossum, rabbit skins, etc., first of all soak them until soft, and then thoroughly scrape and clean of flesh, fat, blood, and dirt, and rinse in clean water. Before the skin is treated is the time to wash the wool of sheepskins, and for this purpose warm water, common soap, and ammonia are as good as anything. Then rinse thoroughly.

Take three parts of alum to four parts of common salt, and dissolve in rain water. Three pounds of alum and four pounds of salt should do 100 small skins, and should be dissolved in enough water to soak them well. It is worth while giving them a second fresh bath, for two or three days, after being in the first week. The skins should be taken out every day, and replaced in a different order, taking care that the solution gets to every part. Start with a weak solution. After this treatment soak them for ten or twelve hours in plenty of clean water to take out the surplus salt and alum, because only that which is combined with the material of the skin is wanted, and all excess tends to make the skin stiff. The water may be changed with advantage. As they are taken out of the water, turn them skin side up, and give them a good scrubbing with warm water and soft soap. Wipe off the surplus with a wrung-out cloth, and hang to dry. As they dry, rub them well over a log to keep them soft, and the work is done. The drying is best done in the wind in the shade.

CHAPTER XXVI.

MISCELLANEOUS HINTS.

Poison for Eaglehawks— Poisoning Crows—Grasshoppers—Proportion of Dead Weight to Live Weight—Measuring Contents of Circular Tanks—Measuring a Haystack—Lime-wash Paint—Sorrel—Preserving Posts—Rain Gauge.

POISON FOR EAGLEHAWKS.

A good way to lay poison for eaglehawks that attack ewes at lambing time is to obtain a newly-skinned sheep carcase, almost sever the shoulder from the body, and place strychnine into the cuts made underneath the shoulder. Treat the hind legs in the same way, seeing that they are replaced in their natural position. When poison is laid in this manner all traces of it are practically hidden. Each bait should be burned after it has been left for a week or ten days.

POISONING CROWS.

Take 5 lbs. of clean fat or tallow, and render it down, and in a pickle bottle of boiling water dissolve three parts of a stick of phosphorus. The hotter the water, the quicker the phosphorus will dissolve. It can also be dissolved in carbon bisulphide. Put the fat, which should be blood-warm or nearly cold, and thin and soft, into a tin dish. Stir the contents of the bottle for a few minutes, and then pour it on the surface of the fat, stirring the latter while the two are being incorporated. Never mind if the phosphorus fizzles a little—some of it is sure to take fire. Then stir the fat for about ten minutes. It is then ready for use. The main thing in mixing is to have the fat clean, warm (not hot), and thin, and to stir it briskly. Next skin a sheep where it dies. Open it down the belly, and with a flat stick plaster the entrails with the poison, putting plenty where the caul should be. Also tear out a rib or two from over the heart and liver—a fancy spot of the crows—and smear with poison. Also, after removing the eyes, put a little in the sockets. Do not put any of the poison outside. The crows always devour the inside of a carcase, and that is, therefore, the place to put the poison. Care should be taken in using the poison. It should not be placed too near a road or homestead.

Strychnine is also used, but does not always kill, as the crows often manage to eject it. It makes them very sick and gives them such a fright that they give the place a wide berth for some time to come. One of the best ways is to chop up some suet very fine. dust some finely powdered strychnine over it and put it upon a fresh sheep skin or drop it about where the crows come to feed. Melted fat with finely powdered strychnine mixed with it and then smeared on fresh sheep skins or made into pellets and laid about their feeding grounds is often effective. Where dead sheep, kangaroos, or other animals are lying about incisions should be made all over and a little strychnine put in.

GRASSHOPPERS.

Grasshoppers lay their eggs in patches, and these patches should be sprayed, burnt over, or otherwise treated within the first week, or at least the first fortnight, after hatching, because then the insects are massed together, and more easily killed than when older.

The treatment recommended is as follows :—One pound arsenite of soda is mixed with 16 gallons of water and 3 or 4 lbs. treacle or sugar, and sprayed in a fine mist on the patch where the young hoppers are hatching. This poisons the grass and kills the hoppers within four days. Due care should be taken to keep stock away from recently-sprayed patches. In South Africa this has been found exceedingly successful, and, with care, not harmful to stock. If arsenite of soda supplies are hard to obtain, arsenated soda (not arsenate of soda), might be tried, using 18¼ ozs. of arsenated soda in lieu of 16 ozs. of arsenite of soda, as in the above formula. Other methods for use in limited areas, with due precautions, are the use of flares, or else burning dry grass over the beds of hatching eggs, ploughing furrows to stem and collect moving hopping swarms, etc.

PROPORTION OF DEAD WEIGHT TO LIVE WEIGHT.

Moderately fattened sheep (shorn) should yield about 58 per cent. dead weight ; excessively fat sheep may yield 64 per cent., or more. The proportion will, however, vary much, according to breed, age, and condition.

MEASURING CONTENTS OF CIRCULAR TANKS.

The following is a simple rule for finding the contents of a round tank :—Multiply the diameter by itself, and multiply the result by .7854. This will give the area of the bottom of the tank. Multiply this by the height to get the cubic contents. Supposing the dimensions to be in feet, the result will give you the cubic contents in feet, and as there are 6¼ gallons in a cubic foot, to multiply the contents by 6¼ will give the cubic contents in gallons.

MEASURING A HAYSTACK.

The process of measuring and estimating the contents and weight of a haystack are simple arithmetical operations. In the case of the former the rule is :—Multiply (in feet) the length by the breadth, and by the sum of the height from the ground to the eaves and one-third of the height from the eaves to the peak. Example :—Breadth, 20 feet ; length, 25 feet ; height to eaves, 10 feet ; eaves to peak, 3 feet—20 x 25 x 11 (one-third of 3 + 10) = 5500 cubic feet.

The finding of the weight of the stack depends upon the number of cubic feet by which to divide in order to arrive at the number of tons. The right figures to divide by are 250 for sheafed hay of good quality, well headed, and not too long in the stem. If the sheafed hay is long and thick in the stem, and not so well headed, the number of cubic feet to the ton will vary from 250 to 300, the time the stack has been up, of course, and its solidity being elements in the calculation ; but the figures do not in any case exceed 300. For loose hay, on the other hand, that is, hay mown and cocked in the field, it takes a larger number of cubic feet to make a ton. If this class of hay is very good, that is, cut green with a good head, and not too coarse, 350 cubic feet to the ton is a fair divisor ; but if it is very coarse and fluffy, and has not been long in the stack, it will take 400 cubic feet to weigh a ton. Even in this case, however, 400 is the extreme divisor.

CHEAP LIMEWASH PAINT.

A cheap limewash paint, which is thoroughly adhesive, and will reduce the temperature of a building if applied to the outside of galvanised iron roofs or walls, can be made as follows :—Break up 1 lb. of glue, and soak for twelve hours or more in plain, cold water ; then pour a kettle of boiling water on it in a kerosene tin, and place it on a slow fire to melt. Meantime, take 1 lb. of alum and melt it with hot water. Also take 10 lbs. fresh lump lime and pour cold water on it to cover it well, and, while the lime is slaking and boiling, add the alum and then the glue. Stir well. If more water is required, add it hot, keeping the mixture stirred, and thin out like milk. This will make about 10 or 12 gallons of wash, according to the quality of the lime. The sooner the wash is used after making the better.

THE SORREL PEST.

Sow the land with Algerian oats; scratch them in with the cultivator in the autumn. Feed off all the winter. Then in the spring, say September, shut the paddock up till it is red with sorrel. Leave it as long as possible without seeding. Then stock the sheep on again. You cannot put too many on. Next graze until ploughing time, and there should be no more sorrel. The essence of the contract is to let the weed get a full growth and as near seeding as possible, then eat it out clean.

PRESERVING POSTS.

In the United States, a method of preserving posts that has been found very successful is to dip the lower ends in crude petroleum and burn off the oil a sufficient distance to come above the ground when set. Hot oil seems to be driven into the post, and this, in addition to the charred covering, keeps it from decay.

HOME-MADE RAIN GAUGE.

A reasonably reliable rain gauge can be made from a kerosene or any other straight-sided tin, the open end being carefully cut in order that the aperture may correspond with the shape of the bottom, and the sides not bulged. It is important that the tin be set up in an open space unaffected by draughts, and on an absolutely level surface. The fall of rain can be measured in the tin with an ordinary foot rule. The registration may not be absolutely accurate, but it will be near enough for all ordinary purposes. An eighth of an inch on the rule will represent 12½ points, quarter inch 25 points, and so on.

CHAPTER XXVII.

Acts and Regulations Affecting the Sheep Owner—Railway Regulations *re* Stock and Fodder—Taxation Returns—Land Laws—Arbitration Awards—Farmers' and Graziers' Associations—Stud Sheepbreeders' Associations—Conclusion.

There are numerous " rules and regulations" governing the sheep-raising business, and in Australia, at any rate, the owner of a flock will be well advised to make himself as *au fait* as possible with the sundry laws to which he is subject. This he can best do by application to the authorities controlling the various Government departments for copies of the Acts and Regulations covering such matters as dipping, droving, branding, shearers' accommodation, etc. It is obviously impossible to set them out here. The laws in different countries and even in the different States of Australia are not the same ; in some cases compulsion exists, in others the grazier is free to do as he pleases—but it is better to make sure of that freedom by inquiry than to take it for granted.

The railways department should be applied to for advice concerning the marketing of stock, application for trucks, rates for store and starving stock and fodder, rebates, and so on. These are all points that are really part and parcel of the sheep grower's business, almost as much as shearing and dipping and other phases of management are. Again, questions of taxation, the dates for forwarding returns for land and income tax, both State and Federal, in Australia, methods of filling up the necessary forms, etc., are all of the utmost importance. Here, however, the " victim" will frequently be compelled to seek legal advice, as the furnishing of the necessary details to the different Commissioners and Deputy Commissioners appointed by State and Commonwealth Governments to collect the taxes is a task of a most complicated and difficult nature.

Taxation in the past in Australia has not been altogether equitable as far as the wool grower—or the primary producer as a class—is concerned. If he makes a good profit in a favourable year, he pays out a big sum for Federal income tax. The next two years, owing to drought, he possibly makes losses, and therefore, we assume, pays no income tax. At the same time no allowance or rebate is made for those losses, and though on the three years his operations may have shown an actual loss, the deficit from the two bad seasons being larger than the profit from the good one, yet he has paid income tax on those three years, and at an extra high rate, because in the only year in which he actually had an income, it happened to be a good one. The obvious remedy for this anomaly is to assess the income of the primary producer on an average of five or even ten years. No other business shows such variability of returns, because no other business is so absolutely at the mercy of seasonal conditions, or if you like—the weather—itself the most variable thing in the universe. Spread the income over a long series of years, good and bad, take the average return, and you arrive at the only fair and equable basis for assessment of the tax. This system has long been striven for by the primary producers of Australia, and at the time of writing, it at last looks as though justice will be done in the matter. As a matter of fact, the entire taxation machinery of Australia could do with a thorough overhauling.

A smattering of knowledge regarding the land laws to which the individual is subject is another necessity. He should at least know what conditions govern his own special form of tenure. They may be many or they may be few, there may be clauses in connection with residence conditions, improvements, etc., but whatever they are they must be fulfilled, and it is no trouble to write to the Lands Department or Government Printer for a copy of the Act or Acts required.

With regard to the innumerable arbitration awards, which cover practically every class of labour employed in any shape or form by the sheep owner, no definite particulars can be set down. They are constantly changing or expiring, new ones are always replacing old, and if any were set out here, probably half of them would be ancient history, worthless, and misleading within a few months.

There is a great deal of overlapping, as is only natural where two tribunals, State and Commonwealth, as in Australia, are prescribing wages and conditions for the same class of labour, and it will be seen, therefore, that the employer is confronted with a strenuous task if he is to please everybody and fulfil the conditions set out by the different Courts without involving himself in a hopeless tangle. The easiest solution of his difficulty is to become a member of the association, farmers', graziers', pastoralists', stockowners', whichever he desires, that exists in his State for the express purpose of guarding his interests and fighting his battles.

The subscription is moderate, and he will soon realise that not only will he serve himself by becoming a member, but that it is a duty he owes to the industry in which he is engaged. The supreme importance of that industry should be self-evident, but unfortunately to politician and public alike it does not appear to be so, and the only way by which it can secure the recognition and rights so essential for its prosperous continuance is through the medium of *powerful* and *representative* associations. Neither power nor thorough representation can be obtained without unity on the part of the individual. Every farmer or grazier should join one of these associations. His membership and his financial and moral support will mean benefits, both present and future, that will far more than repay him the small yearly contribution entailed by his subscription.

In conclusion, another body of a different kind may be mentioned, embracing all the States of Australia—similar associations exist in New Zealand—of which a number of sheep breeders will be well advised to become members, and from which their business will derive considerable benefit. We refer to the Australian Longwool Sheepbreeders' Association, established for the purpose of encouraging the breeding of pure longwool sheep and maintaining uninterrupted purity of the various breeds. Admission into the Flock Book of the Association can only be obtained upon production of undeniable evidence of continued pure breeding, and this fact gives any flock bearing the Association's imprimatur or registered mark a standing in the sheep world, and an advantage in the sale market unattainable by those who do not carry such a hall-mark. Therefore breeders of pure British Longwool sheep should register their studs. They can obtain all necessary forms and particulars as to registration, fees, etc., from the secretary, whose address is 10 Bligh-street, Sydney, N.S.W.; he also acts in a similar capacity for the Corriedale Breeders' Association. Owners of studs of that breed should also register their flocks.

These are steps along the road of progress that leads to the goal of perfection. Perhaps that goal is unattainable, but as long as it beckons and is striven for, there can be no doubt as to the maintenance of a high standard in what is one of the finest professions in the world. Sheep raising offers splendid prospects to-day and for many days to come. No profession offers better, physically, morally, financially. It is a clean, healthy life, and it takes man close to nature, the best remedy in the world for both physical and moral weakness. It has its trials and tribulations, but they breed grit and strengthen the moral fibre—many a calamitous drought in Australia has proved that—and finally it holds out a promise of at least a comfortable living, if not of actual affluence.

The world's demand for wool and meat to-day is keen and likely to remain so, and with moderate capital, practical experience, application, enthusiasm, and ordinary luck—by which is meant freedom from a knock-out drought in the first year or two—there should be little fear of failure. As with every other profession, success or otherwise depends mainly on the man himself, but it must always be remembered that the most important asset for a young man taking up sheep raising is experience. There are certain things that must be learnt under practical conditions, and to attempt to run a flock without the rudiments of practical knowledge is only courting disaster.

Much has been written in these pages that will be of no interest to many, but there are numerous grades in the profession, and as long as every reader derives some degree of assistance—no matter how small—from what is placed before him in this book, it will at least have served a purpose and achieved a useful object.

INDEX.

Age, Judging by Sheep's Teeth, 260
Age Marking, 224
Agistment, Sending Sheep on, 266, 278
Angora Goat, General Notes on, 154
Ante-partum Paralysis in Ewes, 343
Anthrax, 334
"Aphis" Disease, 346
Arsenic for Blowflies, 294
Artesian Bores, 19
Arsenic Drenches, 327
Artificial Grasses, Sowing, etc., 326, 386
Arbitration Awards, 397
Associations, 397

Balanitis, 341
Bale Lifter, 95
"Black Disease"—
  Symptoms, 339
  Treatment, 340
Black Sheep, 128
Blindness in Sheep, 319
Blood Poisoning, 344
Blowflies, Species of, 281
Blowfly Pest—
  General Notes on, 280
  Dipping as a Preventive, 283
  Crutching as a Preventive, 292
  Spraying or Jetting as a Preventive, 284, 291
  Plan of Spraying Yard, 288
  Gaukrodger Spraying Cage, 289
  Chalcid Wasp, 293
  Poison Baits for, 294
  Traps for, 296
  Dressings for Struck Sheep, 298
  Dip Powder as a Preventive, 299
Blown Sheep or Hoven, 346
Border Leicester-Merino Cross, 173
Border Leicester Fleece, 166
Border Leicester Sheep, General Notes on, 139
Bores, 19
Bore Drains, 20
Boulders, Splitting with Explosives, 28
Boundary Fences, 34, 35
Branding Sheep, 229
Breeds, Choice of, 110, 111
Brick and Cement Tanks, 16
Breeding—
  Aims, 301
  Purchasing a Sire, 302
  In-breeding, 305
  Line-breeding, 305
  Selection, 306
  Outcrossing, 306
  Reversion, 307
  Telegony, 307
  Stud Record Keeping, 308
  System of, 311
  Classing, 313
Broken-mouthed Sheep, 262
Broken Legs, 344
Buying Ewes, 112, 118
  „ Rams, 113, 118
Burr in Wool, 166, 239
Bush Fires, 377

Carrying Capacity, 115
Castrating Lambs, 225
Cement and Brick Tanks, 16
Chalcid Wasp, 293
Chloroform for Ringworms, 329
Classing Wool, General Notes on, 233, 234, 235
Classing Sheep—
  General Notes on, 252, 313
  Typical Merino Ram, 254
  Culling, 253
  Typical Merino Ewe, 255
  Weaners, 255
  Breeding Ewes, 256
  Culling on Age, 258
  Plan of Yard, 258
Cheviot Sheep, General Notes on, 149
Circular Tanks, to Measure Contents, 394
Clay Tanks, 16
Comeback Sheep, 170
Concrete-Reinforced Tanks, 17
Condition in Wool, 159
Corriedale—
  Fleece, 165
  Sheep, General Notes on, 150
  Sheep, Points of, 153
Couch, Blue, 277
Crop Rotation, 186
Crops for Ensilage, 367
  „ Feeding off, 268
  „ Forrage, 204
Crossbred—
  Fleece, 165
  Sheep, Drought Resistance, 184
    „ Feeding, 177
    „ Lambing, 180
  Wool, Classing, 241
Crossbreeding—
  Breeding Notes, 179
  Choosing Stock for, 176
  Experiments, 170, 194
  Fixing a Type, 183
  for Export Lambs, 191
  General Notes on, 168
  Systems of, 169, 180, 191
  Working Rams, 179
Crows—
  Picking Eyes, 218, 344
  Poisoning, 217, 392
Crutching, 292
Culling (see Classing).

Dams, 21
  „ Overshot, 21
  „ Timber, 23

Darling Pea, 382
Dead Weight to Live Weight, Proportion, 393
Density in Wool, 161, 313
Dentition of the Sheep, 260
Digging out Rabbits, 351
Dingo Destruction—
    General Notes on, 360
    Gun Trap, 364
    Poisoning, 360
    Trapping, 362
Dingo-proof Fences, 46
Dip (Powder) as Preventive to Blowfly, 299
Dipping—
    as Preventive to Blowfly, 283
    for Lice, 316
    General Notes on, 245
    in Long Wool, 249, 283
    Scalding after, 249
    Soft Water for, 248
    Time for, 250
Dipping Baths—
    Circular Swim Slide, 106, 107
    Concrete, 98, 101
    General Notes on, 98
    Materials for, 98
    Measuring Box, 99
    Steel, 98
    Straight Swim Plunge, 104, 105
    Straight Swim, Walk-in, 101, 103
    To Measure Capacity, 109
    Wood, 98
Dipping Yards, 106, 108
Diseases of Sheep, General Notes on, 323
Divining for Water, 19
Dodder in Lucerne, 374
Dogs, Wild (see Dingoes)
  ,, Sheep, 320
Dorset Horn Sheep, General Notes on, 146
Drafting, Mirrors an Aid to, 233
Drafting Yards—
    Adjustable Race, 70, 71
    Circular, 77
    Double Race, 82
    Fences for, 48
    for 3000 Head, 78, 80
    for 5000 Head, 76
    for 10,000 Head, 75
    Gate Fastening for, 60
    Gate for, 57
    General Notes on, 68
    Lake Cowal Yards, 72, 74
    Race, 69
    Timber for, 69
    V-Pattern, 72, 73
Drains, Bore, 20
  ,, Catchment for Tanks, 9
Drenching Sheep for—
    Fluke, 338
    Impaction, 344
    Lung Worms, 329
    Stomach Worms, 327
Dressings Against Blowflies, 298
Dressing Sheep, 387
Dressing Sheep Skins, 390
Drought—
    Resistance, Merino v. Crossbreds, 184
    Time Management, 265
    Restoring Pastures after, 386
Drying Shed, 93, 94
  ,, Sheep Skins, 389
  ,, ,, Frame for, 389
  ,, Yards, 106, 108
Dumping Wool, 244

Eagles, Poisoning, 392
Ear Marking, 224
English Leicester—
    Merino Cross, 173
    Fleece, 166
    Sheep, General Notes on, 137
Ensilage—
    Feeding Sheep on, 267, 274
    General Notes on, 367
    Crops for, 367
    Feed value, 368, 373
    Pit, 368
    Stack, 372
    versus Hay, 368
Eyes Picked by Crows, 344
Ewes—
    Slipping Lambs, 216
    Ante-partum Paralysis in, 343
    Age of at Breeding, 209
    Garget in, 345
    Joining with Rams, 206
    Advice on Purchasing, 112
    Care of Lambing, 180, 190, 202, 213, 216, 268
    Fecundity of, 203
    Sickness in Lambing, 190, 342

Fastenings for Gates, Stock-proof, 60, 61, 62, 63
Fecundity of Ewes, 203
Feeding—
    Crossbred Sheep, 177
    Lambs for Export, 204
    Sheep in Drought Time, 267, 268, 271, 273, 275
    Off Withered Crops, 268
    Trough, 273
    Sheep on Crops, 186, 189
Fences—
    General Notes on, 33
    Boundary, 34, 35
    Timber for, 35
    Wire for, 36
    Subdivisional, 34, 36
    Six-wire, 38
    Five-wire, 39
    Collapsible Netting, 66
    Four-wire or Lightning, 40
    Rabbit-proof, 43, 352
    Notes on Construction of Netting, 41
    Anti-Corrosive Preparation, 52
    Dog-proof, 46
    For Sheep Yards, 48
    Wire and Paling, 49
    Wire Splices, 50
    Movable Panel, 58
    Collapsible Netting, 66
    Preserving Posts, 394
    Wire Strainer, 50
Fire Beaters, 378, 379
Fire Breaks, 377
Fire Carts, 378, 379
Fire, Sheep in, 317
Flood Gates (see Gates)
Flooding for Rabbit Destruction, 352
Flood, Sheep in, 317
Fluke—
    Symptoms, 337
    Treatment, 338
    and Romney Marsh Sheep, 133
Footrot—
    Symptoms, etc., 331
    Treatment, 332
    and Romney Marsh Sheep, 133

- Fodders, Artificial, 271, 273, 367
- Fodder Trees, 275
- Foundations of a Flock, 114
- Foxes, Protecting Flock from, 218, 366
- Fox Guard for Lambs, 218
- Fox Poisoning, 366
- Fumigation for Rabbit Destruction, 352, 360

- Galvanised Iron Tanks, 11
- „ „ „ Repairing, 16
- Gangrenous Septicaemia, 340
- Garget in Ewes, 345
- Gates—
  - General Notes, 53
  - Five-bar, Single, 54
  - Light Seven-bar, Double, 55
  - Four-bar, Double, 55
  - Rabbit-proof, 56
  - Sheep Yard, 57
  - Movable Panel in Fence, 58
  - Fastening for Sheep Yard Gate, 60
  - Flood, 63, 64, 65, 66, 67, 68
  - Sheep Counting, 58
- Giddiness from Tape Worm, 330
- Grass Fires, 377
- Grasshoppers, Destroying, 393
- Grass Seed, 207, 318
- Grasses, Introduced, 326, 386
- „ Native (see Native)
- Gun Trap for Dingoes, 364

- Half-bred Sheep, 169
- Hampshire Sheep, General Notes on, 145
- Hand-serving, 210
- Hawks, Poisoning, 392
- Hay Stack, Formula to Measure, 394
- „ Protecting, 376
- Hay versus Ensilage, 368
- Herbage (see Pastures and Native Grasses)
- Hessian for Yarding Sheep, 83
- Horn, Maggots inside, 345
- Hoven, 346
- Hydraulic Ram, 24

- Impaction in Sheep, 269, 313
- In-breeding, 305
- Indigenous Pasture Plants, 381
- Intertracheal Injection for Lung Worms, 328
- Intestinal Worms, 323

- Jackeroos, Hints to, 4, 5

- Kemp in Wool, 164
- Kurrajongs—
  - Planting, 31
  - Germinating Seeds, 32

- Lamb Guard, 218
- Lamb Marking—
  - General Notes on, 199, 220, 287
  - Safest Time for, 223
  - Yards, 79, 80, 81, 82, 221
- Lamb Raising for Export—
  - Crossbreeding Tests, 194
  - Crosses for, 192
  - Down Breeds for, 175, 196
  - General Notes on, 187, 198
  - Systems of Breeding, 191
- Lambing, 215
  - Best Time for, 214
  - Country, Best Class of, 200
  - Ewes, Ante-Partum Paralysis, 343
  - Ewes, Care of, 180, 190, 202, 213, 216, 268
  - Ewes, Sickness in, 190, 269, 342
- Lambs—
  - Care of during Drought, 270
  - Destruction during Drought, 269
  - Feeding Export, 204
  - Shearing, 166
  - Weaning, 229, 270
- Lamb's Wool, 166
- Land Laws, 397
- Leicester, Fleece, 166
- „ Sheep, General Notes on, 137
- Lice, 315
- Licks, 270, 329, 338, 340
- Lime Wash Paint, 394
- Lincoln—
  - Fleece, 166
  - Merino Cross, 174
  - Romney Cross, 174
  - Sheep, General Notes on, 135
- Line-Breeding, 305
- Live Weight to Dead Weight, Proportions, 393
- Longwools, Classing Fleeces, 241
- Longwool Sheepbreeders' Association, 398
- Lucerne, 268, 374
- „ Sowing and Cultivation, 374, 375
- Lung Worms, Treatment for, 328
- Lustre in Wool, 161

- Maggots in Horn, 345
- Mallee Nest Tanks, 12
- Management of a Station, General Notes on, 348
- Management of Flock, General Notes on, 206, 315
- Marking Lambs, 199, 220
- „ „ Yards for, 79, 80, 81, 82, 221
- Marking Stud Lambs, 228
- Mating Rams with Ewes, 206
- Melon Vine, Wild, 382
- Merino Ewes for Crossbreeding, 176
- Merino Fleece, 162
- Merino Sheep—
  - General Notes on, 117
  - Covering, 119
  - Folds, 119, 312
  - Development, 119, 254
  - Overshot Jaw, 128
  - Classing, 252
  - Black Fleece, 128
  - Points in Good Ram, 254
  - Points in Good Ewe, 255
  - Drought Resistance, 184
- Merino Wool, Classing, 237, 242
- Mice, Protecting Stacks from, 377
- Mohair, 156

- Native Grasses, 381
  - Improving, 383, 384
  - Sowing, 385
  - Feeding off, 116, 383
  - Restoring after Drought, 386
  - Fattening, 178, 201, 383, 384
- Netting Fences, Notes on, 41, 352
- „ Anti-corrosive Preparation, 52

Oats as Feed in Drought Time, 272
Ophthalmia in Sheep, 319
Outcrossing, 306
Overstocking, 115, 385, 386
    ,, Effects on Sheep's Teeth, 263
Overshot Dams, 21
Oxford Downs Sheep, General Notes on, 148

Painting, 349
Paint, Lime Wash, 394
Paralysis in Ewes, 343
Pasture Plants, General Notes on, 381
Pastures—
    When to Feed, 116. 383
    Improving, 383, 384
    Sowing, 385
    Sheep Fattening, 178, 383, 384
    For Lambs, 201
    Restoring after Drought, 386
Peas for Lambs, 205
Piece Picking, 240
Pit Ensilage, 368
Pit Traps for Rabbits, 357, 358
Plantations, Trees for, 32
Poisoning—
    Blowflies, 294
    Dingoes, 360
    Foxes, 366
    Eagles, 392
    Crows, 392
    Grasshoppers, 393
    Rabbits, Baits, 353, 354
        ,, Water, 355
Poisonous Plants, 277, 381, 382, 383
Posts, Preserving, 395
Preserving Skins, 391
Pressing Wool, 243

Rabbit-proof Fences, 43
    ,, Gate, 46
Rabbit Destruction—
    General Notes on, 350
    Poisoning, 350, 353
    Use of Motor Exhaust, 360
    Trapping, 351
    Digging Out, 351
    Fumigation, 352, 360
    Flooding, 352
    Poisoned Water, 355
    Pit Traps, 357, 358
    Yard Traps, 359
Races for Sheep Yards, 69, 70, 71, 82
Railway Regulations, 396
Rain Guage, Home-made, 395
Rams—
    Advice on Purchasing, 113, 302
    Care of, 207
    Constitution, 208, 303
    Danger of Overworking, 212
    Feeding while Serving, 211
    Joining with Ewes, 206
    Hand-serving, 210
    To make Work, 210
    Percentage of, 208
    Classing, 303
    Fighting, 211
    Swelling in, 340
    Use Good, 207
Rape, 178, 204
Reinforced Concrete Tanks, 17
Reversion, 307
Ring-barking, 26, 30
Ring Tanks, 12

Rolling Fleeces, 242
Rolling Tables, 234
Romney Marsh—
    Crosses, 174
    Fleece, 166
    Sheep, Colour of feet, 134
        ,, General Notes on, 132
    and Fluke, 133
    and Footrot, 133
Ryeland Sheep, General Notes on, 147

Saltbush, 276
Salt for Sheep, 330
Salt Rack, 330
Searing Irons for Tailing Lambs, 227
Selection in Breeding, 306
Sheep's Teeth, Telling Age by, 260
Sheep—
    Choice of Breeds, 110, 111
    Classing (see Classing)
    Dipping Baths (see Dipping)
    Dogs, Selection and Training, 320
    Drafting Yards (see Drafting)
    Diseases, General Notes on, 323
    in Fire, 317
    in Flood, 317
    on the Farm, 177, 185, 204
    Seeded, 318
    Skins, 389
    Without Water, 279
Shearers' Asccommodation, 95
Shearers and Shed Hands, Duties, 233
Shearing—
    General Notes on, 230, 237
    Lambs, 166, 232
    Sheds, Disinfecting, 231
        ,, General Notes on, 84, 231
        ,, Plans of, 85, 86, 88, 90, 91, 92
    Stud Rams, 232
Shelter Belts of Timber, 32
Shropshire Sheep—
    Crosses, 175
    General Notes on, 144
Silage (see Ensilage)
Silt Tanks, 9, 10
Skinning Sheep, 387
Skirting Tables, 233
Skirting Wool, 239
Slaughtering Sheep, 387
Sore Pizzle, 341
Sorrel Pest, 395
Southdown Crosses, 175
    ,, Sheep, General Notes on, 143
Spraying—
    Cage (Gaukrodger), 289
    For Blowfly, 214, 284, 291
    Yard, Plan of, 288
Stack Ensilage, 372
Station Management, General Notes on, 348
Starving Stock (see Drought Treatment)
Stocking up after Drought, 278
Stocking, General Notes on, 111,112, 113, 114, 115
Stomach Worms, 323
Stud Breeding, General Notes on, 301
    (See also Breeding)
Stud Record Keeping, 308
Subartesian Bores, 19
Subdivision, 34, 36
Suckering, 30
Suffolk Crosses, 175
Suffolk Sheep, General Notes on, 141
Supply Tanks, 9

- Surface Tanks, 7
- ,, Capacities, 8
- Swelling in Rams, 340

- Tailing Lambs, 226
- Tanks—
  - Surface, 7
  - Capacity of Surface, 8
  - ,, Circular, 11, 394
  - Contents of Round, Formula, 84
  - Silt, 9, 10
  - Galvanised Iron, etc., 11
  - Stands for, 10
  - Ring or Mallee Nest, 12
  - Troughing, 13, 14, 15
  - Clay, 16
  - Brick and Cement, 16
  - Repairing Iron, 16
  - Reinforced Concrete, 17
  - Supply, 9
- Tape Worms in Sheep, 330
- Taxation, 396
- Teeth of Sheep, to Tell Age by, 260
- Telegony, 307
- Thistle, Variegated, 277, 382
- Three-quarter-bred Sheep, 170
- Timber—
  - Dams, 23
  - Destruction, 27
  - ,, by Explosives, 27
  - ,, by Chemicals, 29
  - Planting, 31
  - For Fences, 35
  - Drafting Yards, 69
- Trapping—
  - Blowflies, 296
  - Dingoes, 362
  - Rabbits, 351
- Tree Fires, 379
- Trees used as Fodder in Drought, 275
- Troughing, 13, 14, 15
- Turpentine for Lung Worms, 329

- Variegated Thistle, 277
- Vermin-proof Fences, 43

- Watering Stock, 116
- Water Supply, 6
- Weaning Lambs, 229
- Wells, 19
- Wheat as Feed in Drought Time, 271
- Wild Dogs (see Dingoes)
- Wire for Fences, 36
- Wire Splices, 50
- Wire Strainer, 50
- Wool Sheds, (see Shearing)
- Wool—
  - Counts, 157
  - Serrations, 158
  - Tops, 157
  - Condition, 159
  - Yolk or Grease, 159
  - Tenderness in, 160
  - Staple, 161
  - Lustre in, 161
  - Character or Crimps, 161
  - Density in, 161
  - Merino Fleece, 162
  - Crossbred Fleece, 165
  - Corriedale Fleece, 165
  - Lincoln Fleece, 166
  - English Leicester Fleece, 166
  - Border Leicester Fleece, 166
  - Romney Marsh Fleece, 166
  - Lambs Fleece, 166
  - Classing (see Classing)
  - Bales, 243
  - Black Fleeces, 128
  - Kemp in, 164
  - Colour in, 165
  - Burry or Carbonising, 166, 239
  - Skirting, 239
  - Pressing, 243
  - Dumping, 244
- Worm Pills, and Tablets, 328
- Worms—
  - Lung, 328
  - Stomach, 323, 327
  - Tape, 330

- Yarding, Hessian for, 83
- Yards—
  - (See Drafting)
  - (See Lamb)
  - Dipping, 106, 108
  - Classing, 258
  - Spraying, 288
- Yard Traps for Rabbits, 359
- Yolk, 159

MELBOURNE:
M'CARRON, BIRD AND CO., PRINTERS,
479 COLLINS STREET.